An Argus Specialist Publication
MAY 1985
90p

Your COMMODORE

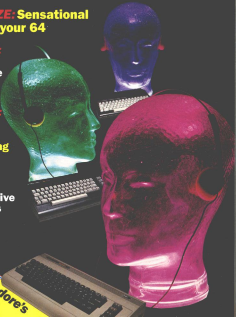
YOUR BEST INDEPENDENT COMMODORE MAGAZINE

SYNTHESIZE: Sensational sounds on your 64

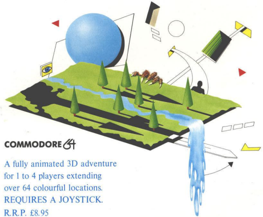
ECONOMIZE: Homemade hardware-we show you how

HARMONIZE: New music series – it's finger-tapping good!

WIN A PRIZE: A 1541 disc drive can be yours



Your Commodore's Voice



Our COMMENT

"IF MUSIC BE THE FOOD OF LOVE, PLAY on", wrote Shakespeare. And, with Spring in the air, who wants a lovesick computer? Not us. To ensure that our readers won't be reported to the A.C.L.C. (Association for Cruelty to Lovesick Commodores) – surely there is such an institution – we bring you this all-singing, all-dancing, May-time music extravaganza.

Those hedonistic heads at Commodore seem to have taken Mr. Shakespeare at his word. Having equipped the 64 with a powerful sound generator chip, SID – Sound Interface Device – and such music making facilities as 3 separate voices, an 8 octave range, modulation and filtering, they have provided a basis for one of the most powerful music synthesisers available on any micro computer.

Music and computers are well-matched bedfellows. Although artistry obviously plays a larger role in creating music, there are similarities between this and writing a computer program. Both have a set of rules and structures to follow; with music, for example, the rules of harmony, counterpoint and timing.

Sound can be reproduced on computers with great precision. It is transmitted as electrical pulses and then stored as binary digits in memory.

You certainly don't have to be a musician or even a whizz at programming to exploit such potential. Our new music series will help you teach even the most discordant Commodore to croon. Also included in Your Commodore this month is your very own music program to type in. Or you can really cheat by jazzing up your sluggish 64 with Siel's CMK 49 keyboard. See our review.

But, maybe you think Shakespeare got it all wrong. Music is anathema to your ears, food is nothing more than bacon sarnies and calories, and your Commodore receives all the love it needs, thank you very much.

OK, so you're the practical type. Well, what could be more practical than realising that some computer add-ons are vastly overpriced and deciding that you could probably do just as good a job yourself, if only you knew how? Drop your excuses, read our D.I.Y. series and make your Commodore the envy of all its fellow computers by kitting it out with a vast array of add-ons such as printer interfaces, motherboards, video leads and RAM/ROM cartridges.

C16 software

"64, 64 – that's all they care about", I hear you say. Not true. We realise that the C16 is fast becoming a popular machine (175,000 sales at the time of writing) and this figure should increase now that some retailers, such as Dixons plc, are selling it at half price following the dramatic cut in the price of the Plus/4. Software companies are, at long last, noticing this machine although a lot of the early releases are of a low standard, many being re-hashed versions of popular 64 games.

But, do not despair, as there are one or two goodies appearing on the scene. The LET Show at the end of February certainly wouldn't win any prizes for innovative software for the more popular and established machines, but it offered a glimmer of hope to C16 owners. Commodore, for example, have now released over 50 titles, from arcade games to sophisticated utilities, for the C16 and Plus/4, and other companies – Melbourne House, Tynesoft, Anirog, Gremlin Graphics and CRL, to name a few – are following suit. We review some C16 games in this month's Software Spotlight section and, next month, we have a C16 software special. So, we don't yet want to see an influx of C16s and Plus/4s into our Classified Ads section!

Survey

Enough of my views. We're always asking for your views in this column and many of you are certainly prolific letter writers. But not enough of you write and tell us about yourselves or what you would like to see more (or less) of in this magazine. So, your forte doesn't lie in letter writing; you'd sooner accept the status quo than put pen to paper? Fear not! We've made it oh so simply for you in our readers' survey. All you need to do is tick a box or string a few words together in response to our questions. What could be simpler? And not only will the results enable us to produce your type of magazine but one lucky reader will win a 1541 disc drive. Turn to the heart of Your Commodore – it's crying for attention!

COMMODORE
YOUR BEST INDEPENDENT COMMODORE MAGAZINE
Sensational sounds on your 64
Homemade hardware-we show you how
New music series – it's finger-tapping good!
1541 disc drive can be yours
Your Commodore's Voice

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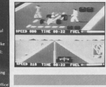
KEYBOARD KAPERS 8

Now you can create the synthesised sounds favoured by so many modern pop stars. Siel's newest keyboard, the CMK 49, enhances the music facilities of your 64.

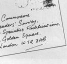


PITSTOP II 33

CBS show that arcade action and motor racing are a winning combination. Treat your 64 to our game of the month.

SOFT ROCK 46

Playing the computer games is no longer a silent pursuit. We look at the crucial role played by music in many of today's top-selling games, such as Ghostbusters or Chiller.



READERS' SURVEY 49

We know that Your Commodore is already the best Commodore magazine to adorn a newsagent's shelf. But, now's your chance to make it even better by filling in our questionnaire. And, what's more, there's a prize up for grabs. Don't delay!

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Every month we shall bring you a subroutine which may be used in a variety of programming applications.

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The last installment in our series on creating your own adventures.

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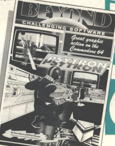
Fieldmaster have entered the field of business software. Your Commodore assessed their output.



Really inexpensive way of writing down whatever comes up on your computer screen.

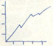
Lightweight and totally portable — independent power source!

Normal, **EMPHASIZED**, CONDENSED and ENLARGED print.

Works perfectly in the dark even during a power cut!

45 characters per second (only in optional "totally-illegible-squiggly-line" mode).

DO



ICS.

Dear Me,
Even writes letters!

The new, portable Epson P40.

Now the home computer user can have a true business quality printer, from Epson – maker of the world's most popular printers.

Our new P40 is only £99.95 – that's including VAT and recharger. It's suitable for BBC, Sinclair, Commodore, Oric and almost any other popular home computer, as well as virtually any portable or desk top micro.

Running off its own rechargeable batteries as well as mains, your P40 is totally portable and being Epson, an absolute doddle to use. And though particularly compact it even gives you 80-column width printing in condensed mode.

So wherever and whenever you want to print, now you can – with the new, portable Epson P40. In fact, anything a ball-point does, it can do – better. See it at selected branches of Boots, or ring 01-200 0200 for details.

EPSON

The Siel CMK 49 comes under Chris Palmer's scrutiny as he assesses Siel's success in synthesising the 64.

KEYBOARD KAPERS!

AT A COST OF £125, WHAT DO YOU GET for your money? Well first and foremost, a keyboard. And a very nice one at that. Its got 49 keys, some of them black and some of them white, so all looks in order. Leading out the back is a ribbon cable which terminates in a cased edge connector which allows you to plug it in to the cartridge port. Of course the hardware is useless without software so there is either a tape or disc containing the control program.

Having plugged the keyboard in, I loaded the software from the tape. While it was loading I had time to make and drink five cups of coffee and my doctor has now advised me to only use disc based software in order to preserve my health! As you might have guessed, the tape is not turboed. Anyway the software finally loaded and it was time to get down to some serious music making.

The major stumbling block of the CMK system is the manual. Considering that most of the people who will buy this package will have very little conception of how a synthesiser works or how to go about creating a sound, the manual fails dismally. For a start it is only 26 pages long and also contains Italian, French and German translations. Admittedly it does tell you how to work the software, but nothing more. Luckily some of the preset sounds are quite good, so if you don't know how to program the SID chip then all is not lost.

Putting aside the manual, let's look at the software. After it has loaded you are confronted with the main menu. This offers you six options. With Edit Play, which I imagine will be the most used option, you are able to select one of the voices stored in memory and play it using the keyboard. Depending on which voice you've chosen the keyboard will either react monophonically (one note at a time) or polyphonically (up to 3 notes at a time). The response off the keyboard is very good, the feel is very positive and this is reflected in the software. I tried some very fast cascading arpeggios and my fingers got tied in knots before the software!

If you decide that you don't like the sound of the voice you can either select another or, if you feel brave enough, edit it. To edit the sounds you move a cursor around the different 'sections' of the synthesiser using the function keys. The values of the different parameters can be changed using the + & – keys. A quick press of the F7 key and the computer will go away and compile your sound so that you can play it from the keyboard. All the elements of the Commodore's SID chip are accessible through the editing software.

My two criticisms of the editing page are, firstly, that it seems to be written in BASIC and, is thus, a little bit on the slow and pedantic side. Secondly, it would be a great help if you could hear the sound whilst you were changing the parameters. It gets really annoying to have to tweak a control and then wait for the sound to be assembled before you can hear the results: you end up going backwards and forwards through the menus with boring regularity before you get the sound right.

The Polyphonic New Sound and Monophonic New Sound options let you create a sound from scratch using the edit page.

The most interesting section of the software is the option labelled Midi Master Keyboard. Using this page in conjunction with Siel's MIDI interface enables you to play other MIDI compatible keyboards from the Siel keyboard. Not staggering in its own right, but Siel also give you the ability to split the keyboard. So what you play on one half goes to one keyboard and the other half to another. Very nice if you like this sort of thing.

The software rounds off with a tape/disc save and load option and an exit page. Also included are a couple of demo songs which show off some of the Commodore 64's presets.

It is very difficult to conclude whether or not this is good addition to a 64 set up. On the one hand the preset sounds and the keyboard itself are very good. Unfortunately the software and the editing let it down. One addition which Siel could make which would certainly swing things in their favour would be an inbuilt sequencer, so that you could at least write and replay tunes.

Siel (UK) Ltd, AHED Depot, Reigate Road, Hookwood, Horley, Surrey RH6 0AY; tel. 0293 776153.

DATA STATEMENTS

LET'S go to the show

THE 1985 LET SHOW COULD justifiably be renamed the 'LET Down' show if judged solely on the lack of new, exciting and innovative software on show. But all was not doom and despondency. For instance, the future is definitely looking brighter for the C16 with more software companies taking this machine seriously and producing software for it. So, with an open mind and a positive outlook, I shall highlight some of the plusses of the show.

Activision announced 10 new games, all of which will eventually be available on the Commodoree 64. This can't be bad news coming from the company who produced the chart-topping Ghostbusters game.

Argus Press Software are really going film crazy. First there was Alien and now their latest release is Give My Regards to Broad St., based (loosely) on the film of the same name. The game involves collecting the members of the band (who, to facilitate your task, only travel on the underground) within 15 hours to re-create a missing tune. It includes the same role-playing facility as Alien, along with a sprinkling of McCartney music. If nothing else, it will certainly improve your geological knowledge of the London underground system!

Alligata Software are jumping on the Frankie bandwagon with their latest 64 release, Blagger goes to Hollywood. And, Anirog set out to prove that games alone do not maketh a show with two new 64 utilities – Super Sketch, a graphics tablet enabling artistically inclined 64 users to create video graphics, and Voice Master, a speech synthesiser and music package.

Ariolasoft announced that it was setting up its own direct selling scheme for independent dealers and **Audiogenic,** amongst other offerings, are planning a C16 version of their Linkword Language course in French and German and a 16K RAM pack for the C16.

Bubble Bus dived into this sea of software with Aqua Racer, an arcade style racing game for the 64, while **CRL** presented a show within a show with a viewing of their Rocky Horror Show game.

Monty Mole creators, **Gremlin Graphics**, were previewing Zargon Wars for the C16. Two other C16 games are also due for release from this company; they are Petals of Doom and Tycoon Tex.

Turning our backs on software for a moment, **Kempston** revealed a new joysticks duo at the exhibition. This comprises the Formula 1, which is modelled on the Pro 5000 series with self-centering and dual control fire buttons for right or left handed play, and the Formula 2, which includes pistol grip for fast firing and top or base buttons.

Jeff Minter of **Llamasoft**, after a digression to the unhairy Psychedelia, returned to the realms of his furry friends with Mama Llama, his latest game for the 64.

Martech, makers of the Official Eddie Kidd Jump Challenge further promoted their sporting image with Brian Jacks Superstar Challenge. And how to cope with all those sporting injuries thus acquired? Just pick up a copy of the computer version of the Living Body, based on the book and series of the same name and privileged to boast as its consultant, Professor Christiaan Barnard.

Melbourne House were one of the first software companies to sit up and notice the C16. Roller Kong is already available on the C16 and Melbourne House are soon to release C16 Wizard and Princess, previously available on the VIC, and C16 Classic Adventure.

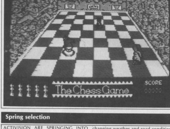
On the more serious side, there was Megabase, a database for the Commodore 64 from **Orpheus, Protek's** Powerplay joystick for the C16, a selection of Commodore interfaces from **RAM Electronics** and The Connection, a 64 interface, from **Tymac.**

Finally, **Tynesoft** had a whole host of C16 games on show, as well as a C16 database called Superfile, and American imports were well represented by **US Gold** who accompanied their display of some excellent games with US music and glamour girls. Maybe in American eyes, whether trade or otherwise, a show is always an excuse for an extravaganza.

DATA STATEMENTS

Northamber to distribute PC

COMMODORE HAVE CHOSEN NORTHamber plc, one of the country's largest distributors of computer peripherals, as the main distributor for the company's range of business systems, including the new 16-bit IBM-compatible Commodore PC. A spokesman for Northamber stated that the new PC ".. is the most exciting product to have appeared in the UK for some time". But, Northamber will get underway with distribution of the 8296D before the PC is launched later this year.



WHEN IS A CHESS GAME NOT A GAME of chess? The answer is when it is Micro Classic's 'The Chess Game', due for release in early summer. The game may be more aptly described as a nightmare, with a hostile chess board where the pieces are against you and the audience howls for your blood. Sounds like good clean fun!

Peter Hodkin, Micro Classic's chief programmer modestly describes The Chess Game as "...a highly developed and brilliantly conceived arcade game". He also claims that the animation is entirely 3-dimensional and that over 750 different sprite definitions are used to animate the main character. We'll just have to wait for the real McCoy in June to see if the Chess Game merits such a description.

Micro Classic, Greenfields, Priory Road, Forest Row, Sussex RH18 5JD.

Spring selection

ACTIVISION ARE SPRINGING INTO action with an array of new titles scheduled for the Commodore 64.

Master of the Lamps entails obtaining your father's long lost crown with the assistance of a magic carpet and geniis. When you solve the complex puzzles presented to you by the geniis, you are rewarded with secrets of the lamps which help you reach your goal – but, not before traversing another 20 levels, accompanied by 7 different musical themes.

Music is also in the air with other Activision offerings The Music Studio provides you with an orchestra of musical instruments with which to create, mix, modify and play your own compositions or your favourite tunes. And Web Dimension is described as a '..musical fantasy of light, colour and sound'. Psychedelia take two?

Rock 'n' Bolt sees you as Louis, the construction man, constructing a 100-storey building while Great American Cross Country Road Race, as the title implies, involves you in a cross country rally complete with such hazards as changing weather and road conditions.

Having explored almost every possible avenue on home computers, software houses have hit upon a new idea – computer novels. Activision have two for starters. In Mindshadow, having awakened on a deserted beach with no memory and no past, you must use a series of clues to discover your identity. The Tracer Sanction traces the progress of a top agent for the Stellar Intelligence Agency as he/she chases the galaxy's most dangerous criminal.

Activision, 15 Harley House, Marylebone Road, London NW1 tel. 01-486 7588.

C16 galore

AT LONG LAST, A NUMBER OF COMPANIES seem to have noticed the C16 and Plus/4. A whole host of software is being produced for it – a lot of it rehashed versions of 64 software but a few new ideas to brighten things up.

- Commodore have announced 18 new titles on cassette, cartridge and disc for the C16 and Plus/4. They now have more than 50 titles available for these machines and are announcing more every week. The programs range from cassette based arcade games to ROM cartridge games and include the Zork adventures for the Plus/4. The prices range from £5.99 for cassette based software to £11.99 for cartridge and disc based programs. Some of the titles available are Stellar Wars/Blitz, Crazy Golf, Harbour Attack, Mayhem, an educational program called Sandcastles and Paramaths and a cartridge based game called Jack Attack.
- If you want to make a complete fool of yourself, why not opt for CRL's first game for the C16 and Plus/4, Berks, selling at £6.95. Or immerse yourself in a fast and furious arcade shoot out – Xargon Wars, £6.95, from Gremlin Graphics.

Commodore Business Machines, 1 Hunters Road, Weldon, Corby, Northants, NN17 1QX; tel. 0536 205555.

CRL, CRL House, 9 Kings Yard, Carpenter's Road, London E15 2HD; tel. 01-533 2918.

Gremlin Graphics, Alpha House, 10 Carver Street, Sheffield, S1 4FS; tel. 0742 753423.

Armchair antics

HOW CAN ELITE HAVE THE AUDACITY to call 'The Dukes of Hazzard a children's programme? My dad, fixed grin on his face and hands firmly clasping the sides of his armchair, must be the Duke boys' biggest fan. But his reaction to immortalising the Dukes as a computer game might not befit a family magazine!

That's what Elite intend to do. They have signed an agreement with Warner Brothers to launch a new computer game based on the series. As with the series, the main characters of the game are Bo and Luke Duke (plus car, of course), and Boss Hogg, Hazzard County sheriff. The game sees them trying to outwit the bungling Boss in a variety of adventures.

The Dukes includes nearly 100 frames of animation on the car, and will be available for the Commodore 64 in the late Spring.

Elite Systems Ltd., 55 Bradford Street, Walsall, England; tel. 0922-611215.

Fast action

THE FIGHT AGAINST PIRACY IS AT LAST being fought in the hallowed halls of government. The Copyright (Computer Software) Amendment Bill passed successfully through its second reading in the House of Commons on 22nd February. The bill will now have to pass through a Committee stage and return to the House of Commons for a third reading. If all goes well, it would come into force two months after being passed by the House of Lords and receiving royal ascent.

If the Bill does become law, software pirates could face very hefty fines and up to two years' imprisonment. This would greatly please William Powell, MP for Corby, who first proposed the bill, and the members of the Federation Against Software Theft (FAST), on whose behalf he acted.

FAST is hoping to draw more public attention to their campaign by producing posters and badges for national distribution. These are far from tame with such slogans as 'Beat the Cheats' and 'You Wouldn't Steal the Hardware – Don't Steal the Software'. Hard Hitting stuff – let's hope it works and that Mr. Powell's bill enjoys a smooth passage to the statute book.

Beat the
CHEATS
You Wouldn't Steal the Hardware
-Don't Steal the Software
FAST FEDERATION AGAINST SOFTWARE THEFT

DATA STATEMENTS

Pictured above is Ian Etheridge (centre), winner of an SX-64 in one of Ariolasoft's prize draws. With him are his nephews, James (left) and Anthony (right), for whom he bought the Ariolasoft game 'Choplifter!' which contained the prize winning coupon. And the boys are winners too for Uncle Ian has given them his old 64 while he gets to grips with his new portable.

But, act quickly if you too would like to win an SX-64: Ariolasoft's monthly prize draws end this month.

Also in our picture are Ariolasoft's marketing and sales director, Frank Brunger (left) and managing director, Ashley Gray.

Ariolasoft, 8 Westminster Palace Gardens, Artillery Row, London SW1P 1RL; tel. 01-222 0833.

Pick up a Penguin

CHEETAHSOFT IS TO EMBARK ON A series of Commodore 64 tape based games featuring Parky the Penguin, and involving Parky in a different adventure every time.

The first game is entitled Parky and The Yellow Submarine which comes with a map showing the locations of each of the 91 screens. The first 50 players to return the map showing the correct locations of the various objects and objectives win copies of Parky's second adventure. Even if you're not lucky enough to win a prize, each game includes a 10% discount voucher which is redeemable against the next Parky game.

Cheetahsoft Ltd., 24 Ray Street, London EC1R 3JD; tel. 01-833 4909.

Fresh incentive

NEW FOR THE COMMODORE 64 from Incentive Software – a trilogy within a trilogy of new releases.

First out of the bag is Moon Cresta which Incentive have bought from Nichibutsu. This is a classic shoot'em up and includes three stage docking and multiple fire power. Moon Cresta costs £6.95 and the lucky player who wins the race to score 30,000 points wins the actual Moon Cresta arcade machine.

A few months back, the puzzled staff at Your Commodore received a piece of card emblazened with the word CONFUZION with, attached to it, a ... sparkler? CONFUZION? There certainly was. This was merely a rather OTT way of announcing yet another game from Incentive – CONFUZION, retailing at £6.95 which, apparently, entails hundreds of Confuzion Bombs on 64 levels and a free hit single. Ah – it's all clear now!

Incentive are also to release a Commodore 64 version of the Ket Trilogy – Mountains of Ket, Temple of Vran, The Final Mission – in the late Spring/early Summer. The price is £9.95 (Read more about the Ket Trilogy in 'Sense of Adventure').

Incentive Software Ltd, 54 London Street, Reading RG1 4SQ; tel. 0734 591678.

128 DOES NOT RUIN 64 SOFTWARE

WHO THEN SPOTTED THE MEGA TYPO in April's Our Comment? The first sentence of the second paragraph should read "The new C128 is compatible with the 64 and can run all its software", not ".. ruin all its software".

We wish to extend our apologies to Commodore Business Machines, especially as the C128 promises to be an excellent machine.

Cherry Picker — Errata

Lines 80 and 81 were omitted from part 3 of this listing. They should read as follows:

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80 IFL<lthenGA=1:RETURN
81 RETURN
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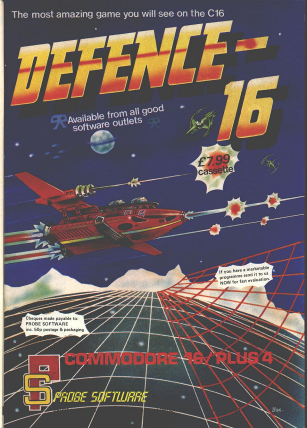

The most amazing game you will see on the C16
DEFENCE-16
Available from all good software outlets
£7.99 cassette
If you have a marketable programme send it to us NOW for fast evaluation.
Cheques made payable to: PROBE SOFTWARE inc. 50p postage & packaging
COMMODORE 16/PLUS 4
PROBE SOFTWARE
Box

TOP 20 Compiled by Gallup Software

COMMODORE 64

TITLE		PUBLISHER
1	Impossible Mission	CBS
2	Ghostbusters	Activision
3	Frak!	Statesoft
4	Raid over Moscow	US Gold
5	Daley Thompson's Decathlon	Ocean
6	Booty	Firebird
7	Slap Shot	Anirog
8	Lords of Midnight	Beyond
9	Combat Lynx	Durell
10	Football Manager	Addictive
11	Bruce Lee	US Gold
12	Hunchback 2	Ocean
12	Fighter Pilot	Digital Integration
14	Pole Position	Atari
15	Beach Head	US Gold
16	Chiller	Mastertronic
17	Flight Path 737	Anirog
18	Jet Set Willy	Software Projects
19	Staff of Karnath The	Ultimate
20	Soft Aid	Various

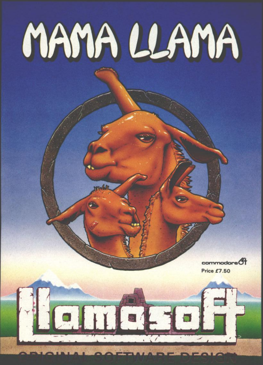
Retail sales for the month ended March 5th 1985

VIC 20 Top Ten

TITLE		PUBLISHER
1	Perils of Willy	Software Projects
2	Hunchback	Ocean
3	Football Manager	Addictive
4	Vegas Jackpot	Mastertronic
5	Micky the Bricky	Firebird
6	Doodlebug	Mastertronic
7	Duck Shoot	Mastertronic
8	Jetpac	Ultimate
9	Snake Bite	Firebird
10	Hektik	Mastertronic

Retail sales for the month ended March 5th 1985

Compiled by Gallup for the industry's weekly trade magazine, Computer and Software Retailing. For details contact John Sorrenti, Computer and Software Retailing, 222 Regent Street, London W1R 3AB. 01-434 2131.


MAMA LLAMA
commodore 64
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Llamasoft
ORIGINAL SOFTWARE DESIGN

At last some of the best Spectrum adventures are available on the 64. Melbourne House's Sherlock and Incentive's Ket trilogy are some of the games to be pulled out of Runecaster's bag of goodies this month.

SENSE OF ADVENTURE

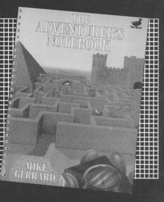
SOME MONTHS AGO WE MENTIONED a very useful item from 'Print n'Plotter' – the **Adventure Planner**, 50 sheets of A3 size sheets especially designed to assist the would be adventurer in keeping track of his travels. Another couple of aids to the weary and lost have been published by Duckworth – **The Adventurer's Companion** (£3.95) by Mike and Peter Gerrard, and **The Adventurer's Notebook** (£3.95) by Mike Gerrard.

The first of these is really a 'cheat book' for four of the better known adventures namely: The Hobbit, Colossal Caves, Adventureland and Pirate Adventure. The book supplies a sensible solution to all the problems you will come across, in such a fashion that looking up your present predicament will not spoil your future enjoyment by giving away too much! Also included are complete maps of all the locations. The stated reason is, for you to check the maps you have made for yourself. Sadly here, it is all too easy to learn too much!

The Adventurer's Notebook is mainly just that, with over half the pages taken up with blank maps for you to fill out as you explore an adventure. Alongside each map is space for you to make notes on objects found, verbs, nouns etc.

There are chapters explaining what adventure games are, their history, together with a few useful hints and tips on playing them. There are also several pages giving a helpful list of often used words and their synonyms.

Looking at this book in a bookshop you may well wonder if you want to spend £3.95 on it ... but once you have been given it for a birthday present you will certainly use it!

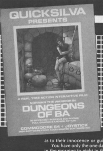


64 Mountains

If all goes smoothly, by the time you are reading this there should be a version of the **Mountains of Ket** available for the CBM 64. This proved to be a winner on the Sinclair Spectrum and rumours have it that an improved version is on the way for us Commodore users.

Mountains of Ket, from Incentive Software, interlinked trilogy of adventures, the other two being **The Temple of Vran** and **The Final Mission.**

Each game is a complete adventure and may be played independently of the other two. The puzzles are good and although the games include a form of combat, this does not seem to spoil the game's attraction (combat can introduce an unacceptable random factor, that does not often enhance the normal adventure!). The Commodore version will include a new feature – an auto-map drawing facility. With this, every time you more to a new location, that location automatically appears on the map. This should certainly facilitate your course through the adventure. Look out for these; they are worth playing...we will 'delve' further when they send us the Commodore versions.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Tale of two tecs

The core of an adventure game is exploration, both of locations and of the objects you find on your travels. What better scenario, then, than that of a detective, story.

If you fancy a bit of deduction – two 'murder mysteries' are available for the CBM 64 – **Deadline**, an Infocom adventure marketed by Commodore, and **Sherlock** from Melbourne House.

Deadline is text only and is only available on disc. Like previous Infocom adventures it has very extensive descriptions of the locations and objects found on your investigations. A reasonably large vocabulary is understood and complex sentence structure may be entered.

The action takes place in the grounds and the house of the late Marshall Robner. The deceased was found two days ago, apparently having taken an overdose of the drug Ebullion. The number of locations is quite small, covering the two storey house (largish) and the extensive grounds.

No graphics could hope to convey the feeling that the wealth of textual description supplies. If anything, Infocom has gone a little overboard this time with the length of some of the location descriptions.

As you play the part of a sleuth, the commands at your disposal are extended. Not only can you EXAMINE the objects around you but you can also SEARCH, SEARCH NEAR and EXAMINE CAREFULLY! You may also dust an object for fingerprints or send something to the police labs for analysis.

There are several people in the house and grounds who may be considered as suspects. They will move around in a seemingly independent manner and may or may not appear to take suspicious actions. It is up to you to interrogate them sensibly and form your own conclusions as to their innocence or guilt.

You have only the one day, from eight in the morning to eight in the evening in which to form you conclusions. Each move you make takes about one minute so you should have enough time.

Deadline supports SAVE and RESTORE and also the facility to have your answers output to a printer for future study! As with other Infocom games, there is no facility to change the text or background colours once the game is loaded. If you find the default switch-on colours are not to your liking for prolonged viewing you must change them prior to loading the game.

There are many advantages to a complex command structure, such as the feeling that you are really part of the scene around you. There are also some pitfalls! 'EXAMINE Sneezo tablets' may seem OK to you, and you may be surprised to be told: 'You can't see that here.' The answer is simply that although you can see the 'bottle of tablets' you cannot see the tablets themselves until you open the bottle. Such are the ramifications of the more sophisticated adventure game!

The instructions supplied with Deadline are comprehensive, explaining the major areas of your investigative armoury in detail. There are also transcriptions of the interrogations of the people in the house at the time of death ... read them carefully.

Not so elementary...

Sherlock by Melbourne House, as the title may suggest, is a hitherto unknown adventure of the famous detective S. Holmes Esq. of Baker Street, London, aided and abetted by his faithful friend and confidant, Dr Watson. You have much to live up to, as you are about to play the part of the great sleuth himself.

The aim of the game is to solve a number of different crimes, while avoiding being killed yourself! The action takes place in 'real time', so travelling by train to Leather Head (the scene of at least two crimes) can become frustrating. Using WAIT enables you to speed things up to a more acceptable timescale.

This program also accepts complex command sentences, such as – 'pick up the note and take the lamp our of the house'. Again with this more articulate(!) type of input, you must take care that the intent of your instruction is fully understood.

Sherlock uses an extended form of 'Inglish' previously used so successfully in The Hobbit. The instructions are fairly clear on how to issue various commands but, in practice, this sometimes leads to a gruelling challenge to find out which words the program really understands. Neither, perhaps understandably, is one completely clear on what you are supposed to do!

The instructions inform us that the Hansom Cab drivers of London do not know where the railway stations are and to get to Victoria Station we must ask to be taken to Buckingham Palace Road! I found this sort of thinking somewhat disturbing especially when I realised that to catch a train I would need to find the appropriate station and the right platform!

The game comes with two additional slips of paper that one can only suspect were afterthoughts to save would-be detectives from giving up too soon! These are a fragment of a train timetable and a 'where to begin' hint sheet!

Mine may have been an early 'undebugged' version but, so far, the program has crashed no less than five times before I've managed to climb into the hansom cab!

Having got to Victoria Station, I am not always able to pay the cabbie! He gets somewhat agitated but lets Watson and I enter the station. Once you have boarded a train, you then have to travel to the right main line station to catch a train for Leather Head.

There are rudimentary graphics for a

number of the locations and they are 'drawn' to the screen very rapidly. The music is reasonable for the first minute or so but, thereafter, becomes a little painful. The text is informative and an effort has been made to give it a Victorian atmosphere.

You may SAVE and LOAD your present position in the game and return later to any particularly tricky situations. The function keys may be used as single key direction commands.

The instructions hint at all sorts of interesting possibilities together with independent action on the part of the other people that you meet, but I have to admit that I found this game boring. There seem to be too many unecessary restrictions put in your path, that have little to do with detecting – the train sequence and the totally unexpected sudden death of Sherlock Holmes – neither of which are conducive to a long addictive game.

Two Action Movies?

Well not quite, but moving towards that idea. Having looked at the field of arcade adventures only two months ago, it is interesting to see another couple of contenders already on the shelves.

Dungeons of Ba from Accelerated Software Inc and distributed by Quicksilva, claims to be 'a real time action interactive film'. It might not completely live up to that but, so far, it is probably the arcade adventure that most closely follows the classic 'Adventure' pattern: explore, examine, learn, die, explore, examine...

Unfortunately, it is only available on disc, but then you were going to buy one this year weren't you? (or you could even win one, if you enter our survey – ed). The scenario is pretty standard: you are an adventurer searching for the fabled 'Stone of Ba', which is to be found under a ruined city. You enter the ruins which promptly collapse behind you. Can you survive, let alone win through with the priceless stone?

Movement is by joystick only, as you guide our hero (you) around a series of screens, evading the guardians and traps that abound. Each screen displays a few passages and rooms for you to explore. In some of these you will find food, arrows or strange potions. You will also trigger off a selection of unpleasant surprises, some lethal.

Having explored the obvious routes that are visible you suddenly realise that by moving your character near to, or at certain walls, further hidden passages and rooms can be found.

Move carefully and be careful what you touch; it's amazing what can happen when you pass over those strange flashing coloured lights.

Movement control is very smooth and the graphics are good. Those giant cobras are enough to give you nightmares! The display is 'from above', giving a partial 3D effect. The sound effects are something again, especially when you are involved in a punch-up with the baddies!

When you enter the dungeons you have an energy level of 4000. As you move about you expend some of this energy, fight a monster and, of course, it decreases more rapidly. Certain actions like finding food increase your energy – but not by much!

The four function keys allow you to: 'Shield' yourself against the arrows that appear from nowhere, 'Fire' an arrow at an adversary, 'Fight' using less energy and 'Take' whatever you may find in your travels.

Of course you could just go into the dungeons and have a jolly fine romp for however long your energy lasted, but that is not the aim of the game is it...The Stone of Ba...remember?

After the first few games it is obvious that the 'screens' are a three by three block. and that you are unable to get to one of these nine. This intensifies the hunt for 'that something missing'; not one, but three items that have to be found before you can descend to further levels. Search for the Crown, the Key and the Sceptre, then try for screen nine!

There are four levels to explore (if you can reach them) and some 200 odd rooms to search for food or weapons to keep you alive – graphics, sound, puzzles and action this one's got the lot.

The Ultimate game?

The Staff of Karnath by Ultimate Play the Game is up to their normal high standard, with smoothly scrolling graphics and plenty of action all round. The number and variation of effects and 'creatures' met is most impressive.

It is certainly in the adventure mould but, unlike Dungeons of Ba, it does require the player to have fairly quick reflexes and a good degree of joystick dexterity.

You must guide Sir Arthur Pendragon around the castle of the long dead sorcerer Karnath. The aim is to find 16 pieces of a pentacle 'key', which will enable you to find the legendary 'Staff of Karnath'. Having found it, you must then destroy this evil artefact before it can wreak its wicked will on the world.

As one might expect, this is not the simple task it sounds! Karnath set a number of otherwordly creatures to guard against the Staff being stolen. Sir Arthur has a number of spells at his disposal...but there is a snag (isn't there always?): he does not know which spell will be effective against the different creatures he will meet.

There is the additional problem of having to complete the Staff's destruction before the hour of midnight, this being Walpugis Night, the predestined hour for the evil to be let loose!

There are ten spells which may be selected in rotation by pressing any key (except F7, this pauses the game for you to wipe the sweat from your fevered brow!). You start with 100% energy and this dwindles fairly rapidly as you move around and are hit by the various evil forces. Each time you find a part of the pentacle and take it to the ancient obelisk where the staff is hidden, your energy returns to 100%.

The action is fast and furious and you must learn how to move around the castle and evade the baddies. The number of locations is not that great but do not think this makes it any easier! There are several puzzles to solve in order to secure the 'keys' – just being able to see them does not mean you can as easily pick them up!

This is an addictive game but will probably appeal more to those adventurers who have a 'Space Invaders' streak in them rather than the classic 'Adventurer'. Get your local computer shop to show you its fine graphics and have a go.

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Who knows the secrets of the 64's resident software? A.P. and D.J. Stephenson do and they're willing to share them with you.

MASTERING MACHINE CODE

THE PERMANENT (RESIDENT) SOFTWARE in the Commodore 64 is buried within various ROM chips. The machine code programmer cannot afford to disregard these ROMs because some important subroutines are available free, providing you know where they are in the address map and how to use them. We begin with some general information on the ROMs.

The BASIC ROM

The ROM which handles the BASIC language occupies position U3 on the printed circuit board and bears the type number 2364A. It is located on the memory map between the range of hexadecimal addresses A000 TO BFFF (40960 to 49151 decimal). This represents 8K worth of intelligence. Now 8K is a very small amount of RAM in which to lay down all the software for a BASIC interpreter. The system programmers have done their best but there is no point in denying that the Commodoree 64 will never be renowned for the quality of its BASIC. It is adequate but free of frills and fuss. Because of this, there is a greater need for, and consequently a greater incentive to learn, machine code in order to supplement BASIC.

The character generator ROM

The dot pattern for 512 different characters are stored in the *character generator* ROM which occupies position U5 on the printed circuit board. It carries the type number 2332A and has an address map range from hexadecimal D000 to DFFF (53248 to 57343 decimal). This means there is 4K of address space allocated just to store 256 characters. At first sight, this may appear rather a lot. But remember the ROM is not storing 512 ASCII codes; it has the job of storing the actual bit patterns required to paint each character on the screen.

A character on the screen is built up from a matrix of 64 tiny dots. The fact that some characters, such as 'I', have only a few dots should not deceive you because the rest of the matrix round the 'I' must contain black dots! The dots you can't see (logic 0) require just as much storage space as those you can (logic 1). Therefore, whatever the character, it still requires 64 bits of storage space. This means that each character requires 8 bytes. Therefore, a 4K ROM (4096 in real money) is not so extravagent after all – it is the minimum necessary to store 512 characters. One set of 256 characters covers the upper case characters and fixed keyboard graphics. The other set of 256 character caters for the normal typewriter-style, upper and lower case characters.

We must emphasise again that the ROM only provides the bit patterns. To actually display a chosen character, it must be stored in that part of RAM designated as screen memory – the range of hex addresses between 400 and 7E7 (1024 to 2023 decimal). Note that this represents exactly 1000 addresses, organised on the screen as 25 lines each of 40 characters. Any character generated by the ROM placed in this area will be displayed on the screen at a position dependent on the current cursor or by a suitable POKE.

The Kernal ROM

The operating system in the Commodore 64 is called the Kernal. The 8K Kernal ROM sits in position U4 on the printed circuit board and bears the type number 2364A. The range of hexadecimal addresses allocated to the ROM extends from E000 to FFFF (59344 to 65535 decimal). This address range is right at the top of memory evidence of its importance. The software within the Kernal ensures that the conflicting demands of the machine sub-units are dealt with in an orderly fashion, according to priority. For example, keyboard scanning and the display system are all under the control of the Kernal. The Kernal contains many useful subroutines which can be tapped by the machine code programmer, a list of which will be given later.

The RAM chips

Some readers may consider discussions on the layout of RAM to be of limited use to a machine language programmer. However, enthusiasm for machine code will increase with experience and can eventually lead to projects which require a more intimate knowledge of hardware

The 64K of user RAM is provided by a bank of eight chips occupying positions U12,U24,U11,U10,U22,U9 and U21. All chips have the type number 4164-2 and each has a capacity of 64K bits (not bytes). Since the memory has to be organised in bytes, eight RAM chips are needed with their address wires, all strapped together.

However, things are not as straightforward as they seem. There are only eight address lines on a chip, labelled MA0 to MA7, which should mean that only 2^8 (256) different address combinations are possible – and yet we need 2^16 (65,536) different addresses.

To reduce the number of pins on large memory chips it has been common practice for some years to supply the full address in two instalments. The addressing matrix within the 64K chip is arranged in eight columns and eight rows. Only eight address lines can therefore be fed to the chip because two control lines, CAS and RAS, switch the first instalment of eight to the row address and the next instalment to the column address. The steering is handled by two 74LS257 multiplexer chips. (A multiplexer, in this sense, is an electrically operated multi-arm switch without moving parts.)

Introducing Kernal subroutines

As mentioned previously, the Kernal contains some useful subroutines which can be utilised in your own programs. It is surprising how much thought is needed to write machine code for even the most simple operations. For example, it is by no means easy to code a routine to scan the keyboard to see if a key has been pressed and, furthermore, to find out which key it was. It may be within your capacity after a little experience but, in the meantime, it saves a lot of worry if you pinch such routines ready made from the Kernal. They form a valuable source of machine code building bricks for splicing into sections of your own code. The Kernal, as far as we are concerned, should be visualised as a jump table containing a set of addresses for calling up the various subroutines. Some are called by a direct jump to the given address but the more important, and more commonly used, subroutines are called via an indirect jump.

The technique of locating a subroutine by means of an indirect jump is well known and is not at all peculiar to the Commodore 64. The reason for this apparently roundabout method is based on the possibility of a future ROM update by manufacturers. No ROM operating system or BASIC interpreter remains 'perfect' for long. Tiny snags or 'awkward features' are brought to the attention of the design team by end users, although it is a matter of polite protocol to refrain from calling them bugs.

After a few months, or perhaps years, of use, the original Mark 1 ROM may be replaced by an updated Mark 2 version with awkward features removed and with perhaps a few extra facilities thrown in as a bonus. It will be appreciated that many of the old subroutines would be shifted around a little in the update ROM and would mean that software prepared on the old ROM may no longer operate on the new ROM. Software incompatability between the old and the new has disastrous effects on the reputation of the manufacturer.

An indirect jump table is a neat solution to the problem. It works because, although the actual subroutines in the new ROM may have a different calling address, the contents of the locations holding the jump vector are correspondingly changed to match them. As an example, suppose that in the old ROM, the address of a certain subroutine was given as $FFD2. In point of fact, this will not be the actual address. It is merely the address of a location which holds the subroutine address. In other words, it is the address vector rather than the address itself. The Kernal jump tables are always changed in a new ROM so that they match the old ROM as far as calling addresses are concerned. (All memory management and input and output subroutines are handled by the Kernal). To sum up, the overall advantages of the Kernal system calling on the resident subroutines are as follows:

1. The user is allowed freedom to intercept the standard operating system call by simply changing the vectored address.
2. It allows the user to modify the normal call or to write in some extra code.
3. Operating system ROMs can be updated and modified without affecting previously written software because new ROMs will retain the old subroutine calling addresses.

Those with fearless and reckless natures can, if they wish, bypass the official subroutine Kernal addresses and, by ferreting out the actual addresses, jump straight to them. This saves a little on execution time but it could be at the expense of personal tranquillity!

Using Kernal subroutines

There are many of these but, to avoid confusion, we shall concentrate on the few most commonly used. Each subroutine has its own special rules for successful operation but, in general, you will need to satisfy the following requirements:

(a) The subroutine NAME

Example: CHRIN

This is for mnemonic purposes only. You cannot directly call up a subroutine by its name unless you previously assign it to the actual calling address.

(b) The calling address

Example: $FFCF

This is the Kernal calling address and will be given in hexadecimal.

(c) Communication registers

Example: A,X

Certain information may require loading into certain registers before a call can be made.

(d) Registers affected

A subroutine requires registers to carry out the work. It is up to the programmer to make arrangements to store valuable data already in these registers before calling the subroutine. Otherwise, the data could be corrupted – a common source of bugs.

(e) Stack requirements.

Nearly all Kernal subroutines use some of the stack locations. Knowing how many they need can often be useful information if there is an imminent danger of stack overflow.

(f) Error returns

Some subroutines can act like a bomb under certain conditions. If these subroutines return with the carry bit set, it indicates that an error condition has been detected. The error number will be left in the accumulator.

(g) Preparation subroutines

Some subroutines will only work if certain others are called first because they may be nesting within each other.

(h) Function

This takes the form of a concise description of the action, which isn't an easy task. The various things which go on must be described completely and must cover all possible conditions of use.

In the following description of Kernal subroutines, we have taken the easy way and covered only the most common applications. Readers who want full data should consult the "Commodore Programmer's Reference Guide", which should be considered the overriding authority. To simplify matters, the following description of certain Kernal subroutines will assume that only the default peripherals, the keyboard and screen, are of interest. A full description, taking into account all possible input/output devices, can obscure the underlying simplicity.

Getting characters from the keyboard

The keyboard, although we tend to think of it as 'part' of the computer, is really nothing more than one of the input peripherals. Input could come from a variety of sources – a tape read, a floppy disc transfer or joystick. However, the operating system does realise that the keyboard is the most common source of input so it is awarded default status. That is to say, a request for input is always assumed to have originated from the keyboard unless there is an overriding instruction to the contrary. Similarly, the screen, although only one of a variety of possible output peripherals, is recognised to be the most used and so, in common with the keyboard, is awarded default status.

CHRIN

Function: Places one byte of data from a previously chosen input device into the accumulator, defaulting to the keyboard. In addition, the cursor is turned on and continues blinking until the keyboard character is recognised as a carriage return (ASCII 13). Up to 80 characters, a logical screen line, can be retrieved one at a time by calling this routine.
Calling address: $FFCF (65487 decimal)
Communicating registers: Accumulator
Registers affected: A,X
Error returns: 0
Preparation subroutines: none required unless the input is to come from a source other than the keyboard.
Stack requirements: seven bytes.
The following two lines indicate how to transfer one keyboard character into the accumulator and then store it in address $C200.

```
JSR  $FFCF
STA  $C200
```

This is simple but, as we have mentioned several times, it is far better to first assign the variable names to absolute addresses so the following method is preferable, even if it appears rather long-winded.

```
CHRIN = $FFCF
SAVE  =$C200
JSR    CHRIN
STA    SAVE
```

The next example develops the idea further by using a loop to transfer a stream of keyboard characters into consecutive memory loctions until such time as a carriage return is detected. Note that, this time, we have included assignments and a possible program counter address.

```
        ★=$C000
        CHRIN=$FFCF
        BLOCK=$C200
        LDY # 0
INPUT   JSR CHRIN
        STA BLOCK,Y
        INY
        CMP # 13
        BNE INPUT
        RTS
```

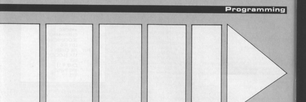
Note that index addressing, using the Y register, is used for storing the characters in the memory block. The loop continues indefinitely until the accumulator contains 13. CHRIN, used in this way, bears a close similarity to the INPUT statement of BASIC

SCNKEY

Function: As its name implies, the keyboard is scanned and, if a key is pressed down, places the ASCII value in the keyboard input buffer. It features interrupt action.
Calling address: $FF9F (65439 decimal).
Communicating register: Accumulator
Registered affected: Accumulator, X and Y.
Error returns: 0
Preparation subroutines: nil
Stack requirements: five bytes
This subroutine is seldom needed on its own. Its main use is to preceed the GETIN subroutine.

GETIN

Function: Removes one character from the keyboard buffer queue and places its ASCII value in the Accumulator. If queue is empty, the accumulator will contain 0.
Calling address: $FFE4 (65508 decimal).
Communicating register: A
Register affected: Accumulator, X and Y
Preparation subroutines: SCNKEY
Stack requirements: seven bytes.
We must be careful with this one because it only transfers characters from the keyboard buffer, not the keyboard. The most obvious preparation subroutine would be SCNKEY. The two combined would represent a reasonable simulation of the BASIC keyword GET because SCNKEY provides the liason between keyboard and keyboard buffer, while



GETIN provides the liason between the buffer and the Accumulator. The following illustrates how a 'wait for character' loop can be written:

```
        JSR SCNKEY
BACK    JSR GETIN
        CMP # 0
        BEQ BACK
```

CHROUT

Function: Outputs a character to the screen at the next printing position. The ASCII code for the character must be resting in the Accumulator before the call is made.
Calling address: $FFD2 (64590 decimal).
Communicating register: Accumulator
Registers affected: Only the Accumulator.
Preparation subroutines: nil
Error returns: nil
Stack requirements: eight bytes
We ended last month with a simple example using CHROUT. The one that follows shows how to use it in conjunction with a few of our previous subroutines.

```
BACK    SCNKEY=$FF9F
        GETIN=$FFE4
        CHROUT=$FFD2
        ★=$C000
        JSR SCNKEY
        CMP   42
        BEQ SKIP
        JSR CHROUT
        JMP BACK
SKIP    RTS
```

SCNKEY puts the keyed character into the buffer queue. GETIN transfers character to Accumulator. If the character happens to be "★" (ASCII 42), the BEQ causes a branch to RTS which is a loop exit. If the character is not "★", the subroutine CHROUT is called and the character is printed on the screen. This is followed by an unconditional jump to BACK ready for the next character. The program can function as a simple typing exercise loop which continues until you enter the asterisk. Yes, we know it can all be done more easily using BASIC but we are supposed to be learning machine code!

RDTIM

Function: Reads the current three-byte value of the system clock into the Accumulator, X and Y registers. The most significant byte is left in the Accumulator and the least significant in Y.
Preparation subroutines: nil
Call address: $FFDE (65502 decimal)
Registers affected: Accumulator, X and Y.
Error returns: nil
Stack requirements: two bytes
The three byte number is in units of 1/60 second – formerly known as the 'jiffy'. The following shows how we might store the three bytes in consective locations, the least significant in TSTOR.

```
RDTIM   =$FFDE
TSTOR   =$C200
CHROUT=$FFD2
★=$C000
STY       TSTOR
STX       TSTOR+1
STA       TSTOR+2
RTS
```

Instead of storing the bytes, we could arrange to display them on the screen with:

```
CHROUT=$FFD2
RDTIM   =$FFDE
★=$C000
JSR       $FFDE
JSR       CHROUT
TXA
JSR       CHROUT
TYA
JSR       CHROUT
RTS
```

Note that the Accumulator is displayed first because it is the most significant byte. We then transfer X (which holds the next significant byte) into the Accumulator before we use CHROUT. Lastly, we transfer Y before using CHROUT. These few lines do not take into account where on the screen the time is to be printed. To avoid further complication, we have to put up with the printing position as defined by the current cursor. This is where the next subroutine can be useful.

PLOT

Function: Depending on the state of the carry bit before calling, PLOT can be used to either find out the value of the cursor X,Y coordinates or to actually set the cursor position to a given set of XY coordinates.

To find what the coordinates are, set the carry before calling. The coordinates will then be returned to the X and Y registers.

To set the cursor coordinates to any position, clear the carry before calling PLOT and load the X and Y registers with the desired coordinates. Unfortunately, you can get into a mess here because, for some reason, the X and Y appear to be chosen 'user-antagonistic' rather than 'user-friendly'. The position along a row, the column position, is the Y value. The position down the screen, the row number, is the X value.

Communication registers: Accumulator x and Y
Preparation subroutines: nil
Error returns: nil

As an example, suppose we want to move the cursor to the 8th position along the line and 6 lines down. We might write:

```
PLOT=$FFF0
LDX    #6
LDY    #8
CLC
JSR        PLOT
```

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THE WELL-TEMPERED 64

In the first installment of a four part series on making music on the 64, Phil South concentrates on synthesis and making sound.

IN ORDER TO MAKE SOUNDS WITH A synthesiser, you need to know what sound is, how a synthesiser makes sound, how it 'colours' it and how it 'shapes' it.

Sound, as you probably remember from physics lessons at school, is made up of waves. A source object vibrates, thus vibrating the air around it, and the resultant invisible concentric spheres of sound radiate outward until they hit your ear. Once there, the soundwaves vibrate the air in contact with your eardrum, and the tiny bones inside your ear decode the speed of the vibrations (frequency) into electrical messages that the brain can understand.

The higher the number of waves crammed into the space between your ear and the source, the higher the sound – a high frequency. The lower the amount of waves between you and the source, the lower the sound – a low frequency.

The colour' of the sound (or 'timbre'), is basically the tone of the sound. It might be high, ready sound, like an oboe, or a deep, hollow sound, like the bottom pipe of a church organ. The colour of the sound is affected by the 'filter' and the 'waveform'. I'll explain these in detail later on.

The shape of the sound, like the difference between a sharp sound such as a snare drum, or the slow build-up of a bowed violin string, is affected by use of the 'envelope' (which is nothing to do with the GPO!). The envelope is also known as the 'ADSR', which stands for Attack, Decay, Sustain, Release. This refers to the way a note is triggered from the keyboard. When you press the key, the attack is how the note starts. With a short attack, the note starts straight away. With a long attack, the note builds up slowly. If the note has a short decay, it tails off almost immediately. If it has a long decay, it rings on for a period of time. The sustain length affects how long the note is held if you continue to hold the key. The release length affects how the sound dies off when you release the key (Figure 1).

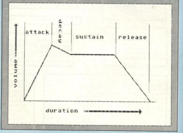
See ya later, Oscillator

The basic sound-making apparatus in a synthesiser is called the oscillator. This is the sound source. The SID chip has three such oscillators, enabling you to build up chords of three notes or complex sounds requiring two or three different waveforms in combination. Each oscillator, or 'voice', has a range of eight octaves, from very low frequencies for bass, to very high frequencies, for treble. Since each voice hasn't got separate column control, we must change their combined volumes every time.

Each oscillator has a choice of three waveforms: triangle, sawtooth, pulse and noise (see Figure 2). As you can see, triangle waves move straight up and down; these have a woodwind sound. Sawtooth waves look exactly like the teeth of a saw, and have a tinny, reedy sound like that of a brass instrument. Pulse waves are square, but are the most versatile wave since the width of the gaps, or 'pulse width', can be finely adjusted to achieve a vast breadth of different sounds. Finally, there is noise which is a random selection of frequencies and is similar to the 'white' noise made by the TV set between stations.

The oscillator is the 'sound source', like the mouthpiece of a trumpet. It makes the basic buzzing which is modified by the brass tubing and horn into a colourful and pleasant sound. The 'modifiers' in a synth are the filter and volume. The filter is a sort of sophisticated tone control, which can either cut off the high or low frequencies of a wave, or a selection of frequencies in a specified wave 'band', like a chunk out of the middle. These different types of filter are available in the SID, and are called, logically enough, the 'high-pass', 'low-pass' and 'band-pass' filters.

Figure 1 — The 'envelope' in operation



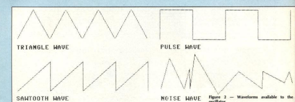


Figure 2 — Waveforms available to the oscillator

SID the singer

OK, so that's the basis of synthesis in a nutshell. But, where can you happy hackers find all these control parameters in the 64's memory? SID resides in the memory at addresses between 54272 and 54300. Here is a list of the addresses in memory where you can find all the controls mentioned above:

Address Function
54272 — Low note value for Osc 1
54273 — High note value for Osc 1
54274 — Low pulse rate for Osc 1
54275 — High pulse rate for Osc 1
54276 — Waveform for Osc 1
54277 — Attack/Decay for Osc 1
54278 — Sustain/Release for Osc 1

54279 — Low note value for Osc 2
54280 — High note value for Osc 2
54281 — Low pulse rate for Osc 2
54282 — High pulse rate for Osc 2
54283 — Waveform for Osc 2
54284 — Attack/Decay for Osc 2
54285 — Sustain/Release for Osc 2

54286 — Low note value for Osc 3
54287 — High note value for Osc 3
54288 — Low pulse rate for Osc 3
54289 — High pulse rate for Osc 3
54290 — Waveform for Osc 3
54291 — Attack/Decay for Osc 3
54292 — Sustain/Release for Osc 3

54293 — High frequency cut-off
54294 — Low frequency cut-off
54295 — Filter ON
54296 — Set Volume and select filter type
54297 — Access to output of Osc 3 envelope generator
54298 — Digitised output from Osc 3
54299 — Digitised output from Osc 3 envelope generator

Now you have the addresses of all the synthesiser functions of the SID chip, you need to know what values to POKE into these locations. First up is the ADSR. By the way, when I say 'high' in these tables it means long, 'low' meaning short, OK?

		ATTACK				DECAY			
Osc	Address	High	Med	Low	Lower	High	Med	Low	Lower
1	54277	128	64	32	16	8	4	2	1
2	54284	128	64	32	16	8	4	2	1
3	54291	128	64	32	16	8	4	2	1

		SUSTAIN				RELEASE			
Osc	Address	High	Med	Low	Lower	High	Med	Low	Lower
1	54278	128	64	32	16	8	4	2	1
2	54285	128	64	32	16	8	4	2	1
3	54292	128	64	32	16	8	4	2	1

In order to obtain values in between, you must combine two or more of the given values; to get a low attack with a high decay, for example, we would add the requisite values together to read, say, POKE 54277,40; Oscillator 1=54277, Low attack=32, plus high decay=8; 32+8=40! Simple, isn't it?

Sustain/Release functions the same way. Volume is set from location 54296, and the range goes from 0, softest, to 15, loudest. Setting the waveform of any oscillator is achieved by POKEing the following values, corresponding to their equivalent waveshapes:

Triangle	17
Sawtooth	33
Pulse	65
Noise	129

The High and Low note values are far too numerous to list here but, to get you started, here are the values for the middle (5th) octave:

	C	C#	D	D#	E	F	F#	G	G#	A	A#	B	C	C#
High	34	36	38	40	43	45	48	51	54	57	61	64	68	72
Low	75	85	126	200	52	198	127	97	111	172	126	188	149	169

Let's write a program!

All the parameters mentioned can be driven from a simple BASIC program format, like so:

```
10 REM -- Give parameters a variable --

20 V=54296: W=54276: A=54277: HF=54273: LF=54272: S=54278: PH=54275:

PL=54274

30 POKE V,15: REM set volume to maximum

40 POKE W,65: REM set waveform to pulse

50 POKE A,190: REM set attack/decay, all the settings added =190

60 POKE PH,15: POKE PL,15: REM set pulse width
```

Then all we have to do, using READ/DATA loops, is load the high and low frequency values and information about duration into the requisite locations, that is to say 54272 and 54273, HF and LF. This sounds our note:

```
70 READ H: READ L

80 READ D

90 IF D=-1 THEN END: REM make -1 your last note value

100 POKE HF,H: POKE LF,L: REM sound the note
```

For durations, all you do is set up a loop to cycle for the duration of the note, and READ the value from the DATA:

```
110 FOR X=D-50 TO D-20: POKE S,136: REM duration plus Sustain/release

120 NEXT X

130 FOR T=1 TO D: NEXT T

140 POKE HF,0: POKE LF,0: REM switch off Oscillator

150 POKE W,0: REM switch off waveform

160 GOTO 30: REM sends you round for the next note
```

All you need then are DATA statements with your note values and durations, in that order, starting at line 170. (Duration 125 for a quaver, 250 for a crotchet, 500 for a minim, and 1000 for a semibreve). I'll leave the tune up to you!

I've given you all the information you should need to get going; just get in there and experiment!

Why a computer, and not a piano?

I'm glad you asked me that. A piano is a fine instrument, a beautiful sound, and one of the most difficult to produce synthetically. But a synthesiser is capable of far more sounds, and the SID is no exception. Also, I challenge any one of you to link your computer to a piano and make it sound like Oscar Peterson.

Computers enable the most tone deaf of us to make beautiful music, and program the built in synthesiser to make our games addictive and gripping: I play a lot of games just to hear a particular sound effect or tune, and extract a lot of pleasure in doing so.

In the next part of this series, I shall be leading you into music programming in a little more detail, and chewing over things like 'imitative synthesis', making one synthesiser imitate another, more conventional instrument. Also, I'll have a couple of programs to key in, and a peek at some pieces of software which can do some of the work for you.

Later in the series, I'll be looking at machine code interrupts, how music can be added to games, and delving deeply into the exciting world of speech synthesis.

That's all folks!

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DISC UNSCRATCH

OCCASIONALLY, A FILE ON disc can become inadvertently scratched due to a mistake or error on the part of the user. If the material is 'backed up', the problem is of no consequence. If not, the user is left either to re-enter the program or retrieve the data from the disc. Fortunately, it would only be a single byte in the directory that was changed during the snatch process which prevents the program from being displayed or loaded.

It is useful to know how the directory is structured in order to appreciate the unscratch routine. The directory is located on Track 18 with Sector 0 containing the location of the first directory T&S and an area of housekeeping information known as the Block Allocation Map. The Purpose of the BAM is to record, for every sector, whether that sector is occupied by an existing file or available for storage. The first T&S of the program file is located on Track 18 and Sector 1, and its layout is explained as follows.

Byte	Remarks
00	Track of next directory (normally 18 but 0 if end)
01	Sector of next directory sector (255 means end)
02	Type of file in use: 0 DELeted or scratched file 129 SEQuential file 130 PRoGram 131 USeR file 132 RELative file
03	Track of first block in file
04	Sector of first block in file
05-20	Name of save file
21-29	Relative file housekeeping
30-31	No. of blocks in file : low/high byte order
32-33	Unused
34-63	File entry 2
66-95	File entry 3
98-127	File entry 4
130-159	File entry 5
162-191	File entry 6
194-223	File entry 7
226-255	File entry 8

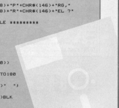
In order to retrieve the scratched file, the disc is initialised to force the drive to re-read the BAM from the disc into its memory and, thus, ensure that the drive is working on the most up-to-date version of the BAM available.

Once the routine has been entered, it should be saved to disc and tried out on a SCRATCH disc. By this, I mean save a few files to disc and then scratch them to check out the routine. In this way, if there are any mistakes in the program, the effect will be on a SCRATCH disc rather than a GENUINE one. The problem can then be resolved without any loss to your valuable programs.

Functional Listing

20	Clear screen and set colours
25-35	Title strings
40	Line of 36 spaces
45	Dimension arrays
50-70	Print title page
75	Check for RETURN key pressed
80-95	File type string generation
115	Initialise drive and open a random file
120	Clear keyboard entry from screen
125	Set track to 18 and sector to 1
130	Check for legal range
135	Specify track and sector to be read into buffer Specify point at which buffer is to read data
140	Read text T&S of directory
145	Set to read 8 files/read FILE TYPE (TY)
150	Read T&S of first block in file Quit if end
155-160	Print file type and name
165-170	Print number of blocks in file
175	Check for scratched file
180	End of file read sequence
185	Update directory T&S
210	Read byte from disc directory
230-285	Recovery routine
310-320	Replace scratched file
340-380	End of sequence or insert new disc

Program Listing

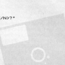


```
READY.

10 REM *********** DISK UNSCRATCH FOR COMMODORE 64 ***********
15 :
20 POKE53280,15:POKE53281,6:PRINTCHR$(147)CHR$(5)
25 T1$=CHR$(117):FORT=1TO16:T1$=T1$+CHR$(96):NEXT:T1$=T1$+CHR$(105)
30 T2$=CHR$(125)+" DISK UNSCRATCH "+CHR$(125)
35 T3$=CHR$(106):FORT=1TO16:T3$=T3$+CHR$(96):NEXT:T3$=T3$+CHR$(107)
40 SPACE$="":FORT=1TO36:SPACE$=SPACE$+CHR$(32):NEXT
45 RE=0:DIMRT(50),RS(50),BP(50),TY(50)
50 PRINTSPC(11)CHR$(17)CHR$(17)CHR$(17)T1$
55 PRINTSPC(11)T2$
60 PRINTSPC(11)T3$
65 FORT=1TO9:PRINT:NEXT
70 PRINTSPC(6)"INSERT DISK     PRESS RETURN"CHR$(17)
75 GETKEY$:IFKEY$<>CHR$(13)THEN75
80 A$(0)=CHR$(18)+"DEL"+CHR$(146):A$(1)="SEQ"
85 A$(2)="PRG":A$(3)="USR":A$(4)="REL"
90 F$(0)=CHR$(18)+"S"+CHR$(146)+"EQ,":F$(1)=CHR$(18)+"P"+CHR$(146)+"RG,"
95 F$(2)=CHR$(18)+"U"+CHR$(146)+"SR,":F$(3)=CHR$(18)+"R"+CHR$(146)+"EL ?"
100 :
105 REM ********* INITIALIZE DISK & OPEN RANDOM FILE *********
110 :
115 OPEN1,8,15,"I0":OPEN5,8,5,"#"
120 PRINTCHR$(145)CHR$(145)SPACE$CHR$(145)
125 T=18:S=1
130 IFT<1ORT>35ORS<0ORS>21THEN290
135 PRINT#1,"U1:";5;0;T;S:PRINT#1,"B-P";5;0
140 GET#5,A$,B$:T1=ASC(A$+CHR$(0)):S1=ASC(B$+CHR$(0))
145 FORI=0TO7:GOSUB210:TY=AAND7
150 FORJ=0TO2:GOSUB210:NEXT:IFA=0THENI=7:T1=255:GOTO180
155 PRINTSPC(6)A$(TY)" "CHR$(34)A$;
160 FORJ=0TO14:GOSUB210:PRINTA$;:NEXT:PRINTCHR$(34)"  ";
165 FORJ=0TO8:GOSUB210:NEXT:GOSUB210:B=A:GOSUB210
170 BLK=A*256+B:PRINTLEFT$(SPACE$,4-LEN(STR$(BLK)))BLK
175 IFTY=0THENGOSUB230
180 GOSUB190:PRINTCHR$(145)CHR$(145):NEXT
185 T=T1:S=S1:GOTO130
190 GOSUB210
195 :
200 REM *************** READ DATA FROM DIRECTORY **************
205 :
210 GET#5,A$:A=ASC(A$+CHR$(0)):RETURN
215 :
220 REM *************** ROUTINE TO RECOVER FILE ***************
225 :
230 PRINTSPC(13)CHR$(17)CHR$(17)"RECOVER (Y/N)?"
235 GETKEY$:IFKEY$<>"Y"ANDKEY$<>"N"THEN235
240 IFKEY$="N"THENPRINTCHR$(145)SPACE$CHR$(145)CHR$(145)CHR$(145):RETURN
245 RT(RE)=T:RS(RE)=S:BP(RE)=32*I+2
250 PRINTCHR$(145)SPC(4)"NEW FILE TYPE: "F$(0)F$(1)F$(2)F$(3)F$(4)
255 GETKEY$:IFKEY$<>"S"ANDKEY$<>"P"ANDKEY$<>"U"ANDKEY$<>"R"THEN255
260 IFKEY$="S"THENTY(RE)=129
265 IFKEY$="P"THENTY(RE)=130
270 IFKEY$="U"THENTY(RE)=131
275 IFKEY$="R"THENTY(RE)=132
280 RE=RE+1
285 PRINTCHR$(145)SPACE$CHR$(145)CHR$(145)CHR$(145):RETURN
```

Program Listing (cont.)

```
290 IFRE=0THEN340
295 :
300 REM ************** REPLACE SCRATCHED FILE ***************
305 :
310 FORI=0TORE-1:PRINT#1,"U1";5;0;RT(I);RS(I)
315 PRINT#1,"B-P";5;BP(I):PRINT#5,CHR$(TY(I));
320 PRINT#1,"U2";5;0;RT(I);RS(I):NEXT
325 :
330 REM *************** END OF DISK SEQUENCE ****************
335 :
340 PRINTSPC(10)CHR$(17)CHR$(17)CHR$(17)CHR$(17)"VALIDATE DISK <Y/N>?"
345 GETKEY$:IFKEY$<>"Y"ANDKEY$<>"N"THEN345
350 IFKEY$="Y"THENPRINT#1,"V0"
355 CLOSE1:CLOSE5
360 PRINTSPC(10)CHR$(145)"ANOTHER DISK  <Y/N>?"
365 GETKEY$:IFKEY$<>"Y"ANDKEY$<>"N"THEN365
370 IFKEY$="Y"THENRUN
375 POKE53280,14:POKE53281,6:PRINTCHR$(147)CHR$(154)
380 END
385 :
390 :
395 *********************************************************
400 *                                                       *
405 *      DISK UNSCRATCH UTILITY FOR THE COMMODORE 64      *
410 *                                                       *
415 *      LES ALLAN               18TH DECEMBER 1984       *
420 *                                                       *
425 *********************************************************
READY.
```



Eric Doyle reckons that CBS Software are definitely on the right track with their sequel to Pitstop.

PITSTOP II: OUR RAVE REVIEW

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£10.95 (cassette)/£13.95 (disc)
CBM 64 + Joystick

DURING THE GRAND PRIX SEASON I am an avid viewer of the dare-devil exploits of Lauder and Co. At last I have found a game which brings some of this excitement to my computer screen. Pitstop II is from the Sega catalogue and forms part of the American assault on the British software market.

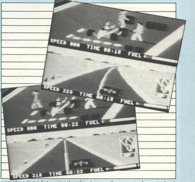
The races take place on one of six international tracks including our own Brands Hatch. Each one can be selected individually or all six can be completed one after the other in the Grand Circuit option.

At the beginning of the game the menu is displayed giving the choice of number of players, track selection, number of laps and one of three levels of difficulty. When the selection is made you are ready to start the game and the screen is split into an upper and lower picture, with player one always at the top.

Control of the car is by natural joystick movement, forwards or backwards for speed change and sideways for steering. In addition to this, pressing the fire button whilst accelerating gives the car a 'turbo boost' which not only increases the normal acceleration rate but also allows a higher speed to be reached.

The screen display shows a 3D view from just behind each car and a graphic representation of the track to the right with a position indicator. Underneath each screen is a speed indicator, timer and fuel gauge. As the race progresses a watchful eye should be kept on the fuel gauge and the tyres (irritatingly spelt 'tires' in the American booklet). Tyre wear is indicated by coloured bars on the top of each wheel which progress through gradually lighter colours until white indicates that a blow out and disaster are only a whisker away. As the name suggests, Pitstops are allowed not only when changing tyres but also when refuelling – an option no longer permitted in the real Grand Prix.

As you accelerate away from your opponent you can afford a quick glance at their screen where you can see your vehicle zooming off into the blue yonder or his car looming up behind you and take the necessary avoiding action. During the race it is impossible to leave the track except for a pitstop but running along the broken white lines at the edges of the road causes tyre wear and loss of speed, as does the occasional collision with one of the other cars encountered during the race.


SPEED 000 TIME 00:18 FUEL
SPEED 220 TIME 00:18 FUEL
SPEED 000 TIME 00:22 FUEL
SPEED 218 TIME 00:22 FUEL

Pitstops are made by pulling off the track at the correct place near the starting grid and then the picture changes to reveal the two members of your crew waiting to assist you. Refuelling is simple to achieve but tyre changes are a different proposition, requiring the manipulation of the crewman back and forth from the car to the tyre stacks. If the fuel tank overflows in the meantime, it empties and must be refilled from scratch.

A leader board is shown at the end of each race. Victory over your opponent does not always mean maximum points because the computer keeps tracks of several other competitors and your performance has to be near perfect to beat them all. To find out who these mystery drivers are you'll have to buy the game – my lips are sealed.

Graphically, this game is excellent; the response of the car is immediate and takes into account the centrifugal forces whilst cornering. I did notice the occasional glitch during the course of a race but these were only quick flickers which did not interrupt the enjoyment. Playing against the computer is only to be recommended at the lowest level because of the computer's highly efficient pit crew. In any case it's far more fun to defeat a human opponent in a battle of speed and efficiency. I've not had such an exhausting sit down for years.

REFERENCE

Not even the book pages have escaped our May time obsession with music. Evelyn Mills assesses two new books covering music on the 64 while Garry Marshall takes a more general look at this machine.

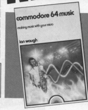
Title: Commodore 64 Music
Author: Ian Waugh
Publishers: Sunshine Books
Price: £6.95

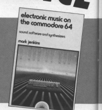
WHATEVER YOU WISH TO KNOW about the musical power of your Commodore 64, it will certainly be found in this book. The author has unlocked the full potential of the SID chip for you to explore in an inventive and interesting manner.

The format is well designed and there is no difficulty in interpreting the data. While there appears to be an excess of REM statements I suspect this is intentional – by the time you have programmed a few chapters you really know what you are doing. May I remind you NOT to omit lines with a colon only; as the author points out these are essential to delete unwanted lines but this information is on the last page and may escape your attention.

The book opens with two chapters on the definition of sound and music. 'What is Music' may defeat the non-musician but the text is well defined for those who wish to understand muscical construction. Thereafter the book is designed to take you through a step by step programming technique, starting with a discussion of the SID chip and a follow through to programming based on this discussion. All capabilities of the Commodore 64 are well demonstrated and each program is constructed in a manner flexible enough for the reader to experiment freely with waveforms, pitch, envelope generator and time loops.

There is a program to convert your Commodore into a monophonic keyboard but the author has extended this to programming in three voices; this is so designed that you may enter your musical compositions or interpretations in scale notation (C, D, E, F, G#, etc.) with octave and time values; rests are also incorporated. This is a very good development of BASIC, and musical data can be saved to tape or disc for replay. Good sample programs are provided.




electronic music on the commodore 64
sound, software and synthesizers
mark jenkins

A most interesting chapter is devoted to 'computer compositions' which compares random selection of notes with a program controlled output.

If you want 'instant music' turn to 'Musical Miscellanea' or 'Zaps and Zings and other Things'; you will not be disappointed.

Altogether this is a most instructive and entertaining book. While the text may appear laborious, there is a wealth of information and all programs are discussed in detail.

The program which I explored (some 80%) were fully functional and the sound generated mostly excellent. Considerable care should be taken when typing in the more complex data.

This is a highly commendable book and excellent value for the price.

Title: Electronic Music on the Commodore 64
Author: Mark Jenkins
Publisher: Sunshine Books
Price: £6.95

THE MAJOR PART OF THIS BOOK IS concerned with a review of the music software, programming aids and hardware available for the Commodore 64 so if you are an ardent programmer you will only find around 20% of the book available for entering. This is made quite clear by the author in his introduction.

There is an extensive introduction on sound and the SID chip. While this is generally dealt with in most books on Commodore music, and is well known to most people, the author explores it in rather more detail.

The sections on 'Music Programs' provide a variety of 'demos' on volume, waveshapes and so forth with an interesting little insert on how to link your joystick to playing from a series of eight notes. Various suggestions are made throughout this section on how to extend your programs but, unless you are experienced in this art, you can merely speculate.

Summaries of the programs are well detailed; 'Music Player' is the most interesting but could be improved with a more explicit screen display. A monophonic keyboard listing is also given.

The review of commercial software and hardware is concise and well detailed.

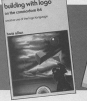
Sound processing is very extensively discussed so for those whose interest lies in converting the Commodore into a synthesiser full details are given on interface devices available on the market.

Title: Building with Logo on the Commodore 64
Author: Boris Allen
Publisher: Sunshine Books
Price: £6.95

THIS BOOK IS AIMED AT A NARROWER segment of 64 users than the previous book as it assumes that its readers have not only a 64 but also the dreaded disc drive and Commodore 64 Logo. I warmed to the book and its author as soon as I read the dedication, which is: "This book is dedicated to my VIC 1540 disc drive, may it rot in hell." Perhaps you need to have written a book yourself to savour the peculiar pleasure that thinking up an appropriate dedication can give!

The first part of the book introduces

LIBRARY



SIMON POTTER
GETTING THE MOST FROM YOUR COMMODORE 64
0
THE INDISPENSABLE GUIDE TO YOUR HOME COMPUTER

Logo generally and the niceties of 64 Logo in particular. The second part develops a range of ingenious and interesting applications.

Logo is the language that is supposed to turn the computer into an educational machine from which we can learn by programming it rather than by having it program us, as is the case with so much computer-assisted education. The language is widely used in schools, although that is not to say that children are the only ones who can benefit from it. Its most widely known feature is the turtle. In addition to this, 64 Logo can maintain sprites. This enhances its value enormously: whereas with one sprite (the turtle) the ideas and concepts of geometry can be explored, multiple sprites allow all sorts of interactions to be investigated.

Against this, 64 Logo has the definite drawback that the horizontal and vertical scales on its screen are different. This means that the turtle moves further down when it takes one step sideways across the screen than when it takes one step up the screen. Worse, it also means that a path that should be a square appears as an oblong while circles become ellipses. This can be corrected by making an appropriate modification to Logo's procedures. Allan shows how to do this although it destroys the essential simplicity that many of the procedures should have.

The introduction to Logo is sound, if similar to a number of others. The examples in the second part are well judged and should draw the reader a long way into Logo. The many illustrations, which are screen dumps of the results produced by Logo procedures, considerably enhance the value and the usefulness of the book.

Title: Getting the most from your Commodore 64
Author: Simon Potter
Publisher: Penguin Books
Price: £5.95

THE COMMODORE 64 HAS ATTRACTED a large number of books, and with good reason – it has a pretty dire manual. As a computer it is both complex and idiosyncratic. It can perform well in all the areas that a personal computer is expected to, but it is often difficult to make it to do so and the secrets of how to make it perform well are relatively well kept.

All this makes the 64 one of God's gifts to authors of computer books. They can write books for large numbers of 64 owners on anything from a simple introduction to many of the complexities of the 64.

When the author of a book that is essentially a replacement for the manual has written computer manuals, the possible consequences are interesting. There are such things as decent manuals, although this may seem hard to believe if you are only familiar with Commodore computers!

This book is intended as a manual replacement. It starts very well indeed. The machine is introduced in a section that is comprehensive, accurately geared to the needs of the absolute beginner and never condescending in any way. It covers setting up the machine for the first time, a beginner's introduction to BASIC, a tour of the keyboard and using the cassette player. The section on the keyboard is particularly good. After reading it even the total novice will have no trouble in getting any colour on the screen and all those graphics characters will be instantly available, including the ones that Commodore don't tell you about. The function keys in programs are explained that seem to trouble newccomers, such as RESTORE, are all dealt with simply and clearly. This section is a great improvement on anything in that spiral-bound thing that comes with the computer!

The second section deals with BASIC programming. The pace is a little fast for beginners. But, the section is good in that there are plenty of programs although the explanations of how they work are not clear and detailed enough. Also, the point of a program is often unclear – sometimes because there is no point in its inclusion other than to introduce some feature of BASIC. Consequently, although the features of BASIC are themselves introduced, the reason for their existence is not made clear at all.

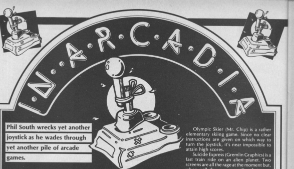
PEEK and POKE, and using the function keys in programs are explained quite well but again, there is no explanation of what they might really be used for.

Next, there is a section on colour, graphics and sound – the 64's strong points. There is nothing wrong with this section, but I thought that it fell pretty solidly between what a beginner would need (a slow and steady approach is necessary to all that POKEing and PEEKing) and what a fairly experienced 64 owner would want (there are many more complete and detailed treatments available).

The next section on peripherals is quite good. It concentrates mainly on Commodore's printers and disc drives. There is a good deal of common sense and sound advice here. I can endorse much of what is said, having used a 1515 printer and 1541 disc drive myself for some time. I think events have overtaken the book's coverage of the 1515 printer. It has been a while since I could get paper for it (it takes a non-standard size), and I don't think that you can easily replace the ribbon either.

The final section of the book is a useful collection of BASIC key words, functions, memory maps and codes.

All in all, the book is a middling example of its kind falling, as I have already suggested, between the needs of the beginner and those of the experienced user. It contains four pages of colour pictures which, as far as I can see, have nothing at all to do with anything written in the book, although they cannot have helped to keep its price down. These are screen shots from application programs such as a word processor, a spreadsheet and a graphics program. If the book had included a section on the availability and uses of such programs, it might have told us rather more about how to get the most from the 64.



IN ARCADIA

Phil South wrecks yet another joystick as he wades through yet another pile of arcade games.

The 'best of all time' award goes to the arcade/adventure, The Staff of Karnath (Ultimate). The sound effects are pretty zippy, too. No hi-scores here – it's too tough!

Ny favourite Manic Miner clone of the moment is Hard Hat Mack (Ariolasoft), a tough little platform game set on a building site. It is pretty challenging with lovely sound and the proud owner of my lowest hi-score this month, 950!

One-on-One (also by Ariolasoft) is a superb basketball game which I found the most addictive out of this month's crop. I advise you to keep your back to the opposing player and move fast.

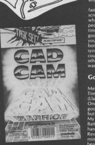
Raid on Bungleing Bay (Ariolasoft) is a cracking shoot-'em up game featuring a heavily armed helijet. You have to destroy factories to prevent the ultimate war machine from being built. It also features effective plan view scrolling graphics.

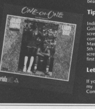
My favourite this month is the totally amazing Cad Cam Warrior (Taskset). This is a new twist on the usual arcade shooting matches with excellent synthesised sounds and a delightful 3D double-sided playing area. This is now the game I reach for instead of Ghostbusters!

Incidentally, my new account number for Ghostbusters is NAME<cr>acc. no. 05426101. This gives you about $72,600!!!).

In the bin

Havoc (Dynavision) is a Zaxxon clone. The graphics and sound are good but you have little or no control over your aircraft. I got bored with it after only an hour.





Olympic Skier (Mr. Chip) is a rather elementary skiing game. Since no clear instructions are given on which way to turn the joystick, it's near impossible to attain high scores.

Suicide Express (Gremlin Graphics) is a fast train ride on an alien planet. Two screens are all the rage at the moment but, when will these guys realise that most people can only look at one screen at a time? The graphics on this game are really good but, because you spend most of your time looking at the map at the bottom, you miss them. The speech synthesis isn't very good: Speak'n'Spell could talk rings around this one! The other noises are much better. My hi-score was 9040.

Golden Oldies

Metagalactic Llamas Battle at the Edge of Time and Revenge of the Mutant Camels (Llamasoft) are great fun. All of the Hairy One's (Jeff Minter, that is!) software is good since Jeff strives to produce taxing but satisfying games of a high standard. My hi-scores are Revenge – 200,890 and Battle – 50,245. But these shouldn't be hard to beat – Jeff Minter's score for Revenge of the Mutant Camels was a mindmelting 900,000 odd! Stand by your beasts!

Tip of the month

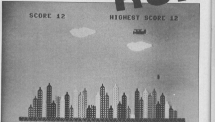
Indiana Jones and the Lost Kingdom (US Gold) is a real brain bender. Clues: 1st screen – transfer the lights; 2nd screen – combination lock; 3rd screen – like Mastermind; 4th screen – who knows?!; 5th screen – kill the creature and dig; 6th screen – teleport and climb. This is a really first class game. My hi-score was 10,600.

Letters

If you have any queries, or have bettered my hi-scores, drop me a line at Your Commodore.

BOMBER RUN

The aim of Les Allan's simple, but highly addictive, game is to bomb as many buildings as possible as you steer your plane back and forth across the sky, gradually homing in on the city.



BOMBER RUN FOR THE COMmodore 64 uses hi-resolution graphics to construct a random city scape and sprites to control the plane, bomb and clouds.

The program gives the following options:

1. Joystick (port 2) or keyboard
2. Skill level (1-5)
3. Plane speed (fast-slow)

As the plane flies across the sky your bombs must destroy the city below to enable the plane to land, re-fuel and embark on another mission.

After each successful landing your flight path is lowered. However, after five successful landings your original flight path is restored and, when applicable, your skill level is automatically increased.

A score table routine is provided which lists the top ten names against their scores. During this sequence the following options are available:

1. Fire button (space bar)....................return to game
2. F 1 ....change skill level
3. F 7 .... quit game

N.B. Program should be saved prior to running as pressing F 7 activates re-set mode (SYS 64738). The program also self runs after 30 seconds.

Data is held in the following areas of memory:

12288 - 12671	sprite graphics
14336 - 15359	keyboard characters
15360 - 15407	hi-res graphics

The REM statements included in the program listing should be helpful pointers to how the program functions. Due to the lowering of memory that takes place during the program only 153 bytes remain free. Therefore, they should be ignored during programming.

Please note that standard abbreviations for BASIC keywords must be used in order to satisfy some line lengths. These appear on pages 130 and 131 in the User Manual.

Line explanation

0	dimension arrays
2	lable sound generator
4	set/clear variables
8-12	set strings for city build
14	set game
16	title page/instruction routine
18-26	set screen
28-36	set sprite coordinates
40-46	control sprite
50	print score
52	check for collission
54-56	advance bomb pointer
58	fire button (space bar) ???
60	drop bomb/demolish building
62	delay to keep speed constant
66	check for plane landing
68	move plane
70-72	landing sequence
74-82	take off routine
84	lower flight path
86-112	print bonus points/pause play
500-510	bomb x,y/determine bomb strength
600-616	check bomb/building contact
700-734	crash sequence
800-804	clear screen/change colour
1000-1044	set up initial options
2000-2036	title page
3000-4024	instructions
5000-5080	score table routine
5500-5606	data

Program notes

1. 64th byte is read but not used for sprite generation.
2. Pointer for protected memory is memory start/256 i.e. POKE 52, 12288/256
3. x coordinate of sprite(n) controlled thus:

```
10 for x = 0 to 343
20 POKE vc+2,x and 255
30 POKE vc+3,y
40 POKE vc+16,int(x/256)*n
50 POKE vc+21,n
60 next
```

4. Video Chip Register

VC	start address (53248)
VC+2	sprite 1 x
VC+3	sprite 1 y
VC+4	sprite 2 x
VC+5	sprite 2 y
VC+17	screen on/off
VC+23	y expand
VC+27	background/sprite priority
VC+29	x expand
VC+31	sprite/character collission
VC+32	border colour
VC+33	screen colour
VC+40	sprite 1 colour
VC+41	sprite 2 colour

5. Main Variables

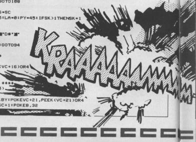
A	read data
B	sprite/character conversion
D	bomb damage
G	1st game
I	data pointer
X	plane x
Y	plane y
AT	attack/decay
BP	bonus poinfs
BS	bomb start
BX	bomb x
BY	bomb y
DX	plane movement
HI	high frequency
HS	high score
KEY	joytick/keyboard address
LO	low frequency
PX	plane x (start)
PY	plane y (start)
SB	flash routine
SC	current score
SS	self start
SU	sustain/release
VC	video chip
VO	volume
WA	waveform
SC(X)	score table (score)
SC$(X)	score table (name)

Program Listing

```
READY.

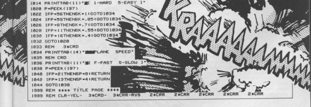

0 DIMSC(10):DIMSC$(10)
2 VO=54296:WA=54276:AT=54277:HI=54273:LO=54272:SU=54278
4 D=0:G=0:CO=11:HS=0:LA=0:SC=0:VC=53248
5 REM GRN YEL GRN
6 FORX=1TO10:SC(X)=0:SC$(X)="█*█BOMBER RUN 64█*":NEXT
7 REM HOM- 24*CRD
8 A$="████████████████████████"
9 REM  40*CRR
10 B$="████████████████████████████████████████"
11 REM **** SEE LINE 6000 FOR [C$] COLOURS ****
11 REM BLK-RED-CYN-PUR-GRN-BLU-YEL-ORN-BWN-LRD-CYN-GR1-GR2-LGN-LBL-GR3
12 C$="████████████████"
14 CS=0:GOSUB800:IFG=0THENGOSUB1000
16 GOSUB2000
18 CS=1:GOSUB800:POKEVC+24,(PEEK(VC+24)AND240)OR14:POKEVC+31,0
19 REM **** SET UP SCREEN ****
19 REM HOM-GRN-  3*CRR CRR
20 PRINT"████SCORE"SC,"█HIGHEST SCORE"HS
21 REM GRN-RVS OFF
22 FORZ=1TO38:PRINTLEFT$(A$,24)RIGHT$(B$,Z)"█E█";:NEXT
24 FORX=3TO36:FORY=0TOINT(RND(1)*(14*SK)+1)
25 REM RVS CRU-CRL OFF
26 PRINTLEFT$(A$,23-Y)RIGHT$(B$,X)MID$(C$,(XAND15)+1,1)"█A█R█";:NEXTY,X
28 IFPY>45THEN32
30 PX=0:PY=45:BS=16
32 X=PX:Y=PY:C1=INT(RND(1)*250+50):C2=344-C1:CL=INT(C1/256)+INT(C2/256)*8
34 POKEVC,C1AND255:POKEVC+1,69+LA*8:POKEVC+6,C2AND255:POKEVC+7,92+LA*8:POKEVC+29
,9
```

```
36 POKEVC+2,XAND255:POKEVC+3,Y:POKEVC+16,INT(X/256)*2+CL:POKEVC+21,11
38 POKEVO,1:POKEAT,68:POKEWA,128:POKELO,7:POKEHI,126
39 REM **** MAIN LOOP ****
40 IFX<4THENDX=SP:Y=Y+8:POKE2041,192
42 IFX<256THENPOKEVC+16,PEEK(VC+16)AND253
44 IFX>255THENPOKEVC+16,PEEK(VC+16)OR2
46 IFX>343THENDX=-SP:Y=Y+8:POKE2041,193
48 POKEVC+2,XAND255:POKEVC+3,Y:POKEWA,129
49 REM HOM-GRN
50 PRINT"■■"TAB(8)SCTAB(34)HS
52 IF(PEEK(VC+31)AND2)=2THENPOKEWA,128:GOTO700
54 IFX<>BSTHEN60
56 BS=BS+8*DX/SP
58 IFX>8ANDX<336ANDPEEK(KEY)=K1ANDD=0THENGOSUB500
60 IFD>0THENGOSUB600:GOTO64
62 FORT=1TOSP*10:NEXT
64 POKEWA,128
66 IFX>296ANDY=213THEN70
68 X=X+DX:GOTO40
69 REM **** LANDING SEQUENCE ****
70 FORT=1TO5:POKE1936,131:FORTT=1TO250:NEXT:POKE1936,132:FORTT=1TO250:NEXT:NEXT
72 POKE1936,32:POKEVC+16,PEEK(VC+16)AND253:POKEVC+21,PEEK(VC+21)AND253:POKELO,0:
POKEHI,0
74 FORX=32TO314STEP2:Y=242-100*SIN(X/200)
76 POKEVC+2,XAND255:POKEVC+3,Y:POKEVC+16,PEEK(VC+16)ORINT(X/256)*2:POKEVC+21,PEE
K(VC+21)OR2
78 POKEVO,1:POKEAT,16:POKEWA,129:POKELO,7:POKEHI,126
80 FORT=1TO10:NEXT:POKEWA,128:NEXT:POKEWA,128
82 POKEVC+16,0:POKEVC+21,0
84 D=0:PX=ABS(PX-344):PY=PY+8:BS=ABS(16-PX)
86 BP=INT((RND(1)*5+10)*SC/100)
87 REM HOM-  6*CRD BLU
88 PRINT"■■■■■■■■"TAB(11)"■BONUS POINTS  "BP
89 REM   2*CRD-  2*CRR
90 PRINT"■■■■YOUR PLANE IS RE-FUELLED AND READY !"
91 REM   3*CRD-PUR
92 PRINTTAB(12)"■■■■________________"
93 REM CYN PUR
94 PRINTTAB(6)"PRESS |◣"D$"■| TO START"
96 PRINTTAB(12)"‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾"
98 IFPEEK(KEY)<>K1THENSB=SB+1:GOTO108
100 IFPEEK(KEY)<>K2THEN100
102 SB=0:SC=SC+BP:IFHS<SCTHENHS=SC
104 LA=LA+1:IFLA=5THENSK=SK+.15:LA=0:PY=45:IFSK>1THENSK=1
106 GOTO18
107 REM   2*CRU-PUR CRD
108 IFSB>20THENPRINTTAB(13)"□□■"D$"■"
109 REM   2*CRU
110 IFSB>40THENSB=0:PRINT"□□";:GOTO94
112 GOTO98
499 REM **** BOMB STRENGTH ****
500 BX=X:BY=Y+8
502 IFBX>255THENPOKEVC+16,PEEK(VC+16)OR4
504 D=INT(RND(1)*SP+SP/2)
510 RETURN
599 REM **** DEMOLISH BUILDING ****
600 B=(1064+(BX-16)/8+(BY-45)*5)
602 IFB>1943THEND=0:GOTO610
604 POKEVC+4,BXAND255:POKEVC+5,BY:POKEVC+21,PEEK(VC+21)OR4
606 IFPEEK(B)<>32THEND=D-1:SC=SC+1:POKEB,32
```



Program Listing (cont.)

```
608 IFPEEK(B+40)=129THENPOKEB+40,130
610 IFD=0THENPOKEVC+21,PEEK(VC+21)AND251:POKEVC+16,PEEK(VC+16)AND251
612 BY=BY+8
614 IFSC>HSTHENHS=SC
616 RETURN
699 REM **** CRASH SEQUENCE ****
700 POKE(VC+16),PEEK(VC+16)AND251:POKE(VC+21),PEEK(VC+21)AND251
702 IFDX>0THENPOKE2041,195
704 IFDX<0THENPOKE2041,196
706 POKEVO,15:POKEAT,68:POKESU,240:POKEWA,129:POKELO,200:POKEHI,40
708 FORV1=15TO0STEP-.25:POKEVO,V1:POKEVC+40,15-V1:FORT=1TO10:NEXTT,V1:POKEWA,128
710 POKEVC+40,CO:POKEVC+27,9
712 FORPY=YTO213STEP2:POKEVC+3,PY:FORT=1TO10:NEXTT,PY
713 REM HOM-  4*CRD
714 PRINT"■■■■■"TAB(10)"HARD LUCK  TRY AGAIN!"
716 FORX=15TO1STEP-1:POKEVC+32,X:POKEVC+33,X:FORT=1TO100:NEXT
718 POKEVC+17,11:FORT=1TO150:NEXT:POKEVC+17,27:NEXT
720 FORT=1TO1000:NEXT
722 POKEVC+21,0:POKEVC+16,0
724 CS=6:GOSUB800
726 POKEVC+24,21
728 POKE198,0
730 GOSUB5000
732 D=0:LA=0:PY=45:SC=0
734 GOTO14
799 REM **** CLEAR/CHANGE SCREEN ****
800 PRINTCHR$(147)
802 POKEVC+32,CS:POKEVC+33,CS
804 RETURN
999 REM **** SET UP GAME START ****
1000 PRINTCHR$(147)
1001 REM CYN
1002 PRINTLEFT$(A$,7)TAB(7)"◣DO YOU WANT JOYSTICKS  Y/N"
1004 P=PEEK(197)
1005 REM RVS OFF
1006 IFP=25THENKEY=56320:K1=111:K2=127:D$="FIRE BUTTON":E$="■FIRE BUTTON■":GOTO1
012
1007 REM RVS OFF
1008 IFP=39THENKEY=197:K1=60:K2=64:D$=" SPACE BAR ":E$="■ SPACE BAR ■":GOTO1012
1010 GOTO1004
1011 REM   3*CRD
1012 PRINTTAB(11)"■■■SKILL LEVEL    1-5"
1013 REM CRD
1014 PRINTTAB(11)"■[ 1-HARD  5-EASY ]"
1020 P=PEEK(197)
1022 IFP=56THENSK=1:GOTO1034
1024 IFP=59THENSK=.85:GOTO1034
1026 IFP=8THENSK=.7:GOTO1034
1028 IFP=11THENSK=.55:GOTO1034
1030 IFP=16THENSK=.4:GOTO1034
1032 GOTO1020
1033 REM   3*CRD
1034 PRINTTAB(14)"■■■PLANE  SPEED"
1035 REM CRD
1036 PRINTTAB(11)"■[ F-FAST  S-SLOW ]"
1038 P=PEEK(197)
1040 IFP=21THENSP=8:RETURN
1042 IFP=13THENSP=4:RETURN
1044 GOTO1038
1999 REM **** TITLE PAGE ****
1999 REM CLR-YEL-  3*CRD-  3*CRR-RVS   2*CRR   2*CRR   2*CRR   2*CRR   2*CRR
```



Program Listing (cont.)

```
2000 POKEVC+17,11:PRINT"▀█████████    ▀██▀  ▀███▼██▀   ▀██▀    ██    ◥"
2001 REM   3*CRR-RVS   2*CRR   2*CRR   2*CRR   2*CRR   2*CRR   2*CRR   2*CRR   5
*CRR   2*CRR
2002 PRINT"████ ██ ██ ██ ██ .. ██ ██ ██ █████ ██ "
2003 REM   3*CRR-RVS   2*CRR   2*CRR   2*CRR   2*CRR OFF RVS   2*CRR   2*CRR   2
*CRR   5*CRR   2*CRR
2004 PRINT"████ ██ ██ ██ ██ ▌██▖ ██ ██ ██ █████ ██ "
2004 REM   3*CRR-RVS OFF   2*CRR-RVS   2*CRR   2*CRR   2*CRR   2*CRR OFF   2*
2005 REM*CRR-RVS OFF RVS-  3*CRR   2*CRR
2006 PRINT"████ █▁◢███ ██ ██ ██ ██ █▁◢███ █▁▁███ ██ "
2006 REM   3*CRR-RVS   2*CRR   2*CRR   2*CRR   2*CRR   2*CRR   2*CRR   3*CRR
2007 REM OFF
2008 PRINT"████ ▁◥██ ██ ██ ██ ██ ▁◥██ ▁▁██   ◤"
2009 REM   3*CRR-RVS   2*CRR   2*CRR   2*CRR   2*CRR   2*CRR   2*CRR   2*CRR   2
*CRR   5*CRR
2010 PRINT"████ ██ ██ ██ ██ ██ ██ ██ ██ █████   ◥"
2011 REM   3*CRR-RVS   2*CRR   2*CRR   2*CRR   2*CRR   2*CRR   2*CRR   2*CRR   2
*CRR   5*CRR OFF RVS
2012 PRINT"████ ██ ██ ██ ██ ██ ██ ██ ██ █████ ██◥ ◥"
2012 REM   3*CRR-RVS OFF   2*CRR RVS OFF   2*CRR-RVS   2*CRR   2*CRR OFF   2*
2013 REM*CRR-RVS   2*CRR CRR-OFF RVS
2014 PRINT"████   ◤██◥ ◤███ ██ ██   ◤██   ██ ██◥ "
2015 REM   3*CRD-RVS   2*CRR   2*CRR   2*CRR CRR
2016 PRINTTAB(12)"████   ◥██ ██ ██ ◥█ "
2017 REM RVS   2*CRR   2*CRR   2*CRR   2*CRR
2018 PRINTTAB(12)"▌ ██ ██ ██ ██   ◥ "
2019 REM RVS   2*CRR   2*CRR   2*CRR   2*CRR
2020 PRINTTAB(12)"▌ ██ ██ ██ ██     "
2021 REM RVS   2*CRR   2*CRR   2*CRR   2*CRR
2022 PRINTTAB(12)"▌ ██ ██ ██ ██     "
2023 REM RVS OFF RVS   2*CRR   2*CRR
2024 PRINTTAB(12)"▌   ◤  ▌██ ██     "
2025 REM RVS   3*CRR-RVS   2*CRR   2*CRR
2026 PRINTTAB(12)"▌  ◥███ ██ ██     "
2027 REM RVS OFF RVS   2*CRR   2*CRR OFF RVS
2028 PRINTTAB(12)"▌ █◥ ◥█ ▼ ██ █◥   "
2029 REM RVS CRR-OFF RVS   2*CRR-OFF RVS OFF   2*CRR-RVS CRR-OFF RVS
2030 PRINTTAB(12)"▌ ██◥ ███◥  ◤███ ██◥ "
2031 REM LGN-CRU   2*CRD-  2*CRL
2032 PRINTTAB(31)"█▪BY████LES ALLAN":POKEVC+17,27
2034 FORT=1TO1000:NEXT
2036 IFG=1THENRETURN
2999 REM **** HI-RES CHARACTERS ****
3000 POKE52,48:POKE56,48
3002 POKE56334,PEEK(56334)AND254
3004 POKE1,PEEK(1)AND251
3006 FORI=0TO1024:POKEI+14336,PEEK(I+53248):NEXT
3008 POKE1,PEEK(1)OR4
3010 POKE56334,PEEK(56334)OR1
3012 FORI=0TO47:READA
3014 POKE15360+I,A:NEXT
3016 FORI=0TO383:READA:POKE12288+I,A:NEXT
3018 POKE2040,197:POKEVC+39,15
3020 POKE2041,192:POKEVC+40,CO
3022 POKE2042,194:POKEVC+41,12
3024 POKE2043,197:POKEVC+42,15
3999 REM **** INSTRUCTIONS ****
4000 POKEVC+17,11:POKEVC+24,23
4001 REM CLR-WHT-  2*CRR
4002 PRINT"▘███
4003 REM **** YOU ARE THE PILOT OF A FIGHTER PLANE ****
4003 REM CRR GRN-RVS OFF-WHT
```

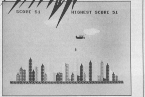
Program Listing (cont.)

```
4004 PRINT"■ ■■┌,♠_‾ ❘┌‾ ┐└┌┐ ┌– ♠ –❘❘‾– ┐♠/■■"
4005 REM   2*CRR
4006 PRINT"■■─────────────────────────────────────────."
4007 REM **** FUEL ****
4007 REM CRD-  2*CRR-YEL
4008 PRINT"■■■■UEL IS RUNNING DANGEROUSLY  LOW AND"
4009 REM CRD-  2*CRR
4010 PRINT"■■■IN ORDER TO RE-FUEL  YOUR BOMBER YOU"
4011 REM CRD-  2*CRR
4012 PRINT"■■■MUST DESTROY  THE ENEMY CITY  BEFORE"
4013 REM **** USE ****
4013 REM CRD-  2*CRR
4014 PRINT"■■■LANDING.  ,SE YOUR BOMBS CAREFULLY AS"
4015 REM CRD-  2*CRR
4016 PRINT"■■■THERE IS ONLY 1 AVAILABLE AT A TIME."
4017 REM **** YOUR ****
4017 REM   2*CRD-  2*CRR-CYN
4018 PRINT"■■■■■ |OUR SKILL LEVEL IS INCREASED AFTER"
4019 REM **** YOU ****
4019 REM CRD-  2*CRR
4020 PRINT"■■■FIVE CONSECUTIVE LANDINGS.   |OU MAY"
4021 REM CRD-  2*CRR
4022 PRINT"■■■CHANGE YOUR SKILL LEVEL UP OR  DOWN"
4023 REM **** GOOD LUCK ****
4023 REM CRD-  2*CRR LRD
4024 PRINT"■■■AT THE END OF EACH GAME.  ■|┌‾– └~"
4025 REM **** USE [FIRE BUTTON/SPACE BAR] TO START ****
4025 REM   2*CRD-  4*CRR-RED BLU RED BLU RED HOM
4026 PRINT"■■■■■■■*** ■/‾ ■"E$" ■┌ ♥|♠┘ ■***■"
4028 POKEVC+17,27
4030 IFPEEK(KEY)<>K1THENSB=SB+1:GOTO4036
4032 IFPEEK(KEY)<>K2THEN4032
4034 G=1:SB=0:RETURN
4036 IFSB>10THENPRINTA$TAB(12)D$;
4038 IFSB>20THENSB=0:PRINTA$TAB(12)E$;
4040 GOTO4030
4999 REM **** SCORE TABLE ****
5000 Z=0:FORX=1TO10:IFSC>SC(X)THENZ=X:X=11
5002 NEXT:IFZ=0THEN5020
5003 REM CLR-  9*CRD
5004 PRINT"■■■■■■■■■■"TAB(7)"ENTER TEXT FOR SCORE TABLE"
5005 REM   3*CRD-  8*CRR   4*CRR  17*CRL
5006 INPUT"■■■■■■■■■■■NAME■■■■...............■■■■■■■■■■■■■■■■■";N$
5008 IFLEN(N$)>15THENN$=LEFT$(N$,15)
5010 FORX=1TO15:Z$=MID$(N$,X,1):IFZ$="."THENN$=LEFT$(N$,X-1):X=16
5012 NEXT
5014 IFZ=10THEN5018
5016 FORX=9TOZSTEP-1:SC(X+1)=SC(X):SC$(X+1)=SC$(X):NEXT
5018 SC(Z)=SC:SC$(Z)=N$
5019 REM CLR YEL GRN YEL CRD
5020 POKEVC+17,11:PRINT"■"TAB(12)"■** ■SCORE TABLE ■**■"
5021 REM CRD-GRN YEL WHT YEL
5022 FORX=1TO10:PRINT"■■ RUN■";X;TAB(10);"■";SC(X);TAB(23);"■";SC$(X)
5024 NEXT
5028 POKEVC+17,27:POKEVC+27,2
5030 FORX=0TO314STEP2:Y=65+100*SIN(X/100)
5032 POKE2041,192:POKEVC+29,2:POKEVC+23,2:POKEVC+40,7
5034 POKEVC+16,INT(X/256)*2:POKEVC+2,XAND255:POKEVC+3,Y:POKEVC+21,2
5036 NEXT
5038 POKEVC+21,0:POKEVC+2,0:POKEVC+3,0:POKEVC+29,0:POKEVC+23,0:POKEVC+40,CO:POKE
VC+27,0
```

```
5039 REM **** CHANGE SKILL LEVEL ****
5040 IFPEEK(197)=4THENSB=0:SS=0:CS=0:GOSUB800:GOSUB1000:RETURN
5042 GOTO5052
5043 REM **** RE-SET COMPUTER ****
5044 IFPEEK(197)=3THENSYS64738
5045 REM **** RE-START GAME ****
5046 IFPEEK(KEY)<>K1THEN5052
5048 IFPEEK(KEY)<>K2THEN5048
5050 SB=0:SS=0:RETURN
5052 SB=SB+1:SS=SS+1:IFSS=300THENSB=0:SS=0:RETURN
5054 IFSS>75ANDSS=<150THEN5066
5056 IFSS>150ANDSS=<225THEN5074
5057 REM ORN PUR ORN
5058 IFSB=<2THENPRINTA$TAB(7)"□PRESS ■"E$" □TO START";
5060 IFSB>2ANDSB=<4THENPRINTA$TAB(13)D$"";
5062 IFSB>4THENSB=0
5064 GOTO5046
5065 REM ORN WHT ORN
5066 IFSB=<2THENPRINTA$TAB(7)"□PRESS ■[F1]□ TO CHANGE LEVEL";
5067 REM RVS-WHT OFF
5068 IFSB>2ANDSB=<4THENPRINTA$TAB(13)"■■[F1]■";
5070 IFSB>4THENSB=0
5072 GOTO5040
5073 REM ORN YEL ORN
5074 IFSB=<2THENPRINTA$TAB(7)"□ PRESS ■[F7]□ TO QUIT GAME! ";
5075 REM RVS-YEL OFF
5076 IFSB>2ANDSB=<4THENPRINTA$TAB(14)"■■[F7]■";
5078 IFSB>4THENSB=0
5080 GOTO5044
5499 REM **** HI-RES DATA ****
5500 DATA0,24,24,24,24,60,126,255
5502 DATA255,153,153,255,255,153,153,255
5504 DATA128,152,153,255,255,153,153,255
5506 DATA56,56,16,124,186,186,40,108
5508 DATA56,186,146,124,56,56,40,108
5510 DATA90,165,90,189,189,90,165,90
5511 REM **** PLANE F'WARD ****
5512 DATA0,0,0,0,0,0,0,0
5514 DATA0,0,0,0,0,0,0,0
5516 DATA0,0,0,0,0,0,0,0
5518 DATA0,0,0,0,0,0,0,0
5520 DATA0,0,0,0,0,0,0,96
5522 DATA255,254,240,24,96,240,48,192
5524 DATA255,255,227,255,255,251,127,255
5526 DATA255,127,255,251,15,255,195,0
5527 REM **** PLANE B'WARD ****
5528 DATA0,0,0,0,0,0,0,0
5530 DATA0,0,0,0,0,0,0,0
5532 DATA0,0,0,0,0,0,0,0
5534 DATA0,0,0,0,0,0,0,0
5536 DATA0,0,0,0,0,0,0,127
5538 DATA255,6,6,24,15,3,12,15
5540 DATA199,255,255,223,255,255,255,255
5542 DATA254,223,255,254,195,255,240,0
5543 REM **** BOMB ****
5544 DATA0,0,0,0,0,0,0,0
5546 DATA0,0,0,0,0,0,0,0
5548 DATA0,0,0,0,0,0,0,0
5550 DATA0,0,0,0,0,0,0,0
5552 DATA0,0,0,0,0,0,0,0
5554 DATA60,0,0,24,0,0,60,0
5556 DATA0,60,0,0,60,0,0,60
```

Program Listing (cont.)

```
5558 DATA0,0,60,0,0,24,0,0
5559 REM **** CRASH F'WARD ****
5560 DATA0,0,0,0,0,0,0,0
5562 DATA0,0,0,0,0,0,0,0
5564 DATA0,0,0,0,0,0,0,0
5566 DATA0,0,0,0,0,0,0,0
5568 DATA0,0,255,0,0,24,0,96
5570 DATA48,254,240,255,96,240,255,192
5572 DATA255,255,227,255,255,251,127,255
5574 DATA255,127,0,251,15,0,195,0
5575 REM **** CRASH B'WARD ****
5576 DATA0,0,0,0,0,0,0,0
5578 DATA0,0,0,0,0,0,0,0
5580 DATA0,0,0,0,0,0,0,0
5582 DATA0,0,0,0,0,0,0,0
5584 DATA0,0,255,0,0,24,0,127
5586 DATA12,6,6,255,15,3,255,15
5588 DATA199,255,255,223,255,255,255,255
5590 DATA254,223,0,254,195,0,240,0
5591 REM **** CLOUD ****
5592 DATA0,0,0,0,0,0,0,0
5594 DATA0,0,30,0,0,127,128,14
5596 DATA255,192,63,255,240,127,255,252
5598 DATA127,255,254,255,255,254,255,255
5600 DATA254,255,255,254,127,255,252,127
5602 DATA255,248,63,255,224,63,255,128
5604 DATA31,255,0,15,255,0,7,252
5606 DATA0,1,240,0,0,0,0,0
6000 REM **************************
6002 REM **** VIC 1515 PRINTER ****
6004 REM **** VIC COLOURS ONLY ****
6006 REM **************************
6008 REM **** LINE 12  TO READ ****
6010 REM ****    CTRL KEY 1    ****
6012 REM ****    CTRL KEY 3    ****
6014 REM ****    CTRL KEY 4    ****
6016 REM ****    CTRL KEY 5    ****
6018 REM ****    CTRL KEY 6    ****
6020 REM ****    CTRL KEY 7    ****
6022 REM ****    CTRL KEY 8    ****
6024 REM ****    LOGO KEY 1    ****
6026 REM ****    CTRL KEY 3    ****
6028 REM ****    LOGO KEY 2    ****
6030 REM ****    LOGO LEY 3    ****
6032 REM ****    LOGO KEY 4    ****
6034 REM ****    LOGO KEY 5    ****
6036 REM ****    LOGO KEY 6    ****
6038 REM ****    LOGO KEY 7    ****
6040 REM ****    LOGO KEY 8    ****
6042 REM **************************
6044 REM
7000 REM **************************
7002 REM **************************
7004 REM ****** BOMBER   RUN ******
7006 REM ****** COMMODORE 64 ******
7008 REM ****** LES    ALLAN ******
7010 REM ****** 18TH JULY'83 ******
7012 REM **************************
7014 REM **************************
READY.
```



The sounds of real music have come to your computer. Tom Nash has composed some notes.

SOFT ROCK

IF YOU HAVEN'T SEEN GHOSTBUSTERS yet, then it's about time you took a look – or rather a listen. I'm no great fan of the game. It smacks too much of real work – travelling around town as a sort of supernatural Rentokil man rounding up slimy sprites instead of rats and other rodents. But the music is magic. Even if you've had it up to here with Ray Parker Jnr's original disco mix and you bust a blood vessel every time they re-run the promo video, you'll still never tire of pressing the space bar to hear 'Ghostbusters' ring out from your 64.

Sound has started to sell software. And, more often, the sound that sells a game is the same one that sells recent records. Ghostbusters would be an unimpressive game without the backing track. And its impact would be reduced even further without the chart hype of a current hit single.

Ghostbusters wasn't the first, but it is the best example to date. Remember Mastertronic's Chiller – even less memorable ghosts, though they were cut-rate ones, backed by an even bigger chart-topper. Or rather it was, until Michael Jackson decided to collect his cut by pointing out (not personally, of course, but through channels) the minor problem of copyright.

So, if you've seen the film, listened to the record, watched the video, worn the t-shirt, eaten the junk food (slimeburgers a speciality), then you'll be queueing up to play the game. Or at least that's what the marketing boys are banking on. And to a certain extent they're right. I'm not going to fork out the meagre amounts of my income that could be termed disposable on yesterday's fashions. There are no flares on me (*That's what you think, bell-bottoms – Ed.*). With software staying in the charts for about the same length of time as singles, it's not surprising that some bright spark hit on the idea of combining the two. After all, it's the only way of giving games air-play on the radio.

Something old...

Cashing in on current chart commercialism isn't the only way of putting a sound-track to software. Others are approaching the problem differently. PSS for example, have plumped for the golden oldie, Give Peace a Chance, for their new game, Theatre of Europe. The game is a sort of strategic war-game in which you must decide when nuclear weapons are your only alternative to an endless diet of vodka and caviar (Pass the bottle – Ed.). Gary Mays of PSS told me they chose the music to underline the point that there can be no winners in a nuclear holocaust. It just worries me that the constant drone of John Lennon's drop-out dirge will have me either pushing the button or pulling the plug on the game.

As well as providing the backing for games, the music business has also offered itself as a theme for some new software. There was Virgin's The Biz, which wasn't, Taskset's Jammin', which was and, of course, Frankie goes to Hollywood, which isn't yet. Look out for more games about, and by, pop stars as more of them look for things to do with their hands now that sound sampling in the studio has taken away the need for musical prowess.

Not everyone is adapting existing ditties or cashing in on chart success. Some software houses are employing, or commissioning, talented musicians to write new music especially for games. Beam Software, the Aussie writing arm of Melbourne House, has a couple of people working solely on software soundtracks as part of their games designing team. And they're not bad for Aussies, considering the country has so far produced only one musician of note, Rolf Harris, and he ought to stick with his didgeredoo and drawing board. Take a listen to Zim Sala Bim to see what I mean. There's a good Chuck Berry song just in the title.

New Generation Software have gone not for a Sixties song but a Sixties songster, Brian Doe. (You know, the Doe bit of Dave, Dozy, Bonky, Dick and Bitch, lots of cracking whips and stuff. Or was it Doe, Ray, Me Far and So but I thought that was Julie Andrews which rather cuts out the whips bit!). He has written the music for Cliff Hanger and Travels with Trashman. Not classics of our time perhaps but certainly improvements on the bleeps and boosters of earlier computer games.

Copyright

So how does a software house go about acquiring the rights to a piece of music? Until recently a lot of them didn't bother. Just slap it in and hope that nobody who is anybody notices.

But now, there is Rocksoft which controls and negotiates the copyright for music which is to appear on software. It was Rocksoft which took Mastertronic to task over the unauthorised use of Thriller and it is to Rocksoft that PSS went when they wanted to use Give Peace a Chance.

If you want to add music to your own games, you don't have to worry about all this, of course. As long as you're not selling your software there's nothing to stop you using any music you like. However, if you do decide that you want to submit your latest masterpiece to a software house for consideration, remember that it might be tricky for them to acquire the music you want. And it might be tricky for you to take it out – so think ahead.

Come on feel the noise

Perhaps you should also consider other ways of giving atmosphere to your games without any music. Explosions are a doddle, of course, and old hat but there are plenty of other ways of bringing your characters and games to life. Take a look at Impossible Mission. If you can match the sound of those footsteps crunching down the corridors or the scream as our hero plunges into oblivion, then you don't need music. Sound effects really haven't been exploited to the full yet. Let's have some creaking doors in your Gothic horrors or thundering hooves in medieval battles.

Even software music is stuck in a rut – everyone follows the safe motto, bland is best. What I want to hear is a good drum roll just before the swish of the guillotine chops off my head. It's hard to keep suspense up or even sleep at bay if there's only one tune playing and you've been at the game for the last four hours.

Maybe the real solution has been supplied by the youngest hippy of them all, Jeff Minter. Psychedelia is a music program without a single note of music on it. You provide the music, he provides the graphics to go with it and it works as well for Wagner as for Wham. The plot's not much cop but the patterns are great. And it has the one software soundtrack you can never get bored with – silence.

COMMODORE 64 SOFTWARE

DATABASE: Datafile — a database with very powerful options. Includes:— print all/selective records, delete, amend, save, load, copy, alphanumeric sort, user defined fields, memory check, total numeric fields, multi field interrelational, wildcard and search between limited. Multiple file option, and many more. Fully menu driven with complete instructions. Disk and cassette fully compiled. Outstanding value.

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League Soccer for Vic 20 + 16K	£6.99
New: 64 League Soccer with many more features still	£7.99

Whodunnit 12 guests have gathered for drinks at Murder Manor, but one of them has more than drinks on his mind. Addictive and thrilling detective game for 1 to 6 players, with genuinely different game each time.

Whodunnit for Vic 20 + 8K or any CBM 64 (state which)	£5.99

Top of the Pops Easy to learn game about the music business. For up to 10 players. Includes printer/game save features.

Top of the Pops for Vic 20 + 8K	£5.99
New: 64 Top of the Pops — even bigger and better	£6.99

Election Night Special Lead your own Party into the next General Election. A game for 1-3 players. Printer/game save.

Election Night Special for Vic 20 + 8K or any CBM 64	£5.99

Party 4 Four games to match the progress of your party: Masterword, A Day at the Races, Game X (Strip Poker) and Consequences. Harmless fun (nothing offensive) but good fun.

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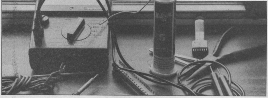
Mike Roberts introduces a new series in which, each month, you will learn how to build all those computer components you've always wanted but have never been able to afford.

THE HARD FACTS



HAVE YOU LOOKED AT THE PRICE OF add-ons for your Commodore 64 recently? Astronomical aren't they. Simply connecting a monitor to the video/audio I/O socket is a great song and dance – the correct lead and plug combination is simply not available. Yet it is very easy operation to hook up a 64 to an industry standard green screen monitor at around £100 – the type that gives excellent reproduction for programming, word processing (I am using a Kaga Denshi 14 inch green screen monitor to write this), and for preventing arguments over Dallas (whether it be on BBC or ITV!) whenever you want to use the 'domestic' TV for anything useful.

Another example is connecting printers. The Centronics interface is the standard method of connecting printers to computers. However, the 64 cannot do this. Not because of anything that is particularly difficult (the hardware interface is built into the machine) but Commodore failed to provide the software in the operating system. This software is quite simple to produce and some of the smaller software companies have been manufacturing the cables and software for some time. I have recently seen a package of software and hardware selling for £20 in Boots. The component cost of the cable is very small and the software can be knocked up over an evening.

This opens up the wide world of cheap highly advanced centronics-type printers, with a much increased specification over the standard Commodore item.

There are many other items like this that are either too expensive for a manufacturing company to 'tool up' or are so simple to construct, but can be made by the home user with a reasonable knowledge of methods and materials.

Things to come

In the following few months I will be giving full details on how to construct the simple things, such as printer interfaces and video leads, working through the medium difficulty units like a motherboard or a slo-mo module, and then getting to the more difficult devices like battery backed up RAM/ROM cartridges or extra 64/128/(256!)K RAM cards.

All projects will have extensive instructions for build up, designed for the absolute beginner, full lists of components and where to get them. Most will be from Tandy, this is for reasons of availability more than anything. There will also be a list of alternate suppliers where you can get the stuff by mail order, which is a little cheaper (and that is, after all, the main reason for DIY).

Getting started

There are certain items you need before you start. Pliers, wire cutters, and a soldering iron are definite musts – you cannot start without them. The iron should be very thin with a quarter inch tip, and be a high wattage. A multimeter is also very useful for various tasks and, as the ultimate luxury (and only if you have one anyway, or know how to use one) an oscilliscope (preferably triggering and a storage type). Knowledge of how to solder is also necessary, but I shall cover that when I present the first project next month.

If you think you will be interested in this series (and you will) you can start the preparations now. Learn to solder and look up some books on the subject

Next month I will be dealing with the connections for the monitor mentioned above, a Centronics interface with full software to drive it, and the initial preliminaries on PCB construction.

READERS' SURVEY

Here it is – the survey that will help us to produce your type of magazine.

Since Your Commodore first adorned newsagents' shelves in October 1984, our office has been inundated with readers' letters. But one reader's meat is certainly another's poison! For all of you who seem to prefer Your Commodore's more serious side – programming articles or business features – there are as many who would rather indulge in more light-hearted pursuits such as typing in games or reading software reviews.

But only a small proportion of you are helping to keep the GPO in profit! Thus, our survey. We'd like to know the views of the silent majority. Who are our readers? What sort of computers or peripherals do they own? What type of software do they buy? And, most important of all, what sort of magazine do they want?

That's not all. The lucky reader whose entry is first out of the Your Commodore hat on the closing date wins a 1541 disc drive.

This is your Commodore magazine so your views count. Please turn the page and fill in the questionnaire. You've got nothing to lose!

1. PERSONAL DETAILS

Name .... Sex (M/F).......

Address ....

....

....

Telephone ....

Age (please tick):
Under 16 ☐ 16-21 ☐ 21-25 ☐
25-35 ☐ 36-50 ☐ Over 50 ☐

Profession..

2. COMPUTER DETAILS

Which computer(s) do you own?..

....

Which disc drive(s) do you own?..

Which printer(s) do you own? ....

Do you own any other peripherals or add-ons? (please specify) ....

....

How long have you had a computer?..

If your first computer wasn't a Commodore, how long have you had a Commodore computer?........

....

Do you use your computer for the following – all the time/more than half the time/sometimes/never?

Original programming ....

Typing in games/utilities from books/magazines..

....

Playing games ....

Education ....

Business..

Who else uses your computer – nobody/spouse/parent/children/other? ....

How much do you intend to spend on hardware and peripherals in the next year?....................

3. SOFTWARE

How much do you spend on software over a 6 month period? ....

How often do you buy the following type of software?

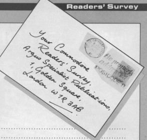
Games ....

Business software ....

Educational software ....

Utilities ....

Do software reviews influence your buying? Yes ☐ No ☐
Do adverts influence your buying? Yes ☐ No ☐
Do you follow the Gallup charts? Yes ☐ No ☐



4. YOUR COMMODORE

Which are you? Regular reader ☐
Occasional reader ☐
New reader ☐

How do you obtain Your Commodore?

Newsagent: Regular order at – W H Smith ☐
J Menzies ☐
Fourboys ☐
Martins ☐
NSS ☐
Lavells ☐
Other ☐
Not ordered ☐
Delivery ☐ Computer Shop ☐ Subscription ☐
Do you ever have trouble obtaining a copy? ....

How many other people read your copy? ....

What do you like best in Your Commodore (please tick)?
News ☐
Software reviews ☐
Book reviews ☐
Utilities to type in ☐
Adventure column ☐
Letters ☐
Programming articles ☐
Hardware reviews ☐
Games to type in ☐
Business page ☐
Arcade column ☐
Competitions ☐
Interviews with programmers or software houses ☐
What is your overall favourite? ....

Which listings do you type in?
Games All ☐ Some ☐ None ☐
Utilities All ☐ Some ☐ None ☐
Which do you prefer? Long programs ☐ Short programs ☐

What would you like to see more of in Your Commodore? ....

....

....

....

5. OTHER MAGAZINES

Which other Commodore magazine(s) do you buy?
Commodore Horizons ☐ Commodore User ☐
Commodore Computing International ☐ Your 64 ☐
Which other computer magazines do you buy? ....

....

6. CLUBS

Are you a member of any Commodore user clubs (Yes/No) ....

If yes, please specify ....

....

When you have completed the questionnaire – please turn the page and see what you can win.

WIN A 1541 DISC DRIVE

Not only is a disc drive essential if you wish to use your 64 for business applications but more and more top quality games are now available on disc. Melbourne House, for example, have released a disc version of their best-seller, the Hobbit. Because of the extra memory available, disc games are far more powerful and offer extras, such as superior graphics, which are not feasible on cassette games.

But, disc drives are far more expensive than cassette units. If a choice has to be made, most 64 owners will opt for the cheaper datasette.

Commodore's 1541 single disc drive could be yours if you take part in our readers' survey. The 1541 disc drive can hold up to 170,000 bytes on a 5¼" diskette. Any part of the diskette can be accessed in a few seconds. The disc drive would normally cost you £229. Now there's a chance you shouldn't miss!

Just fill in the questionnaire tear it out and send it to:

Your Commodore Readers' Survey
Argus Specialist Publications
1 Golden Square
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The closing date is May 31st 1985

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The DIARY 64 program lets you start at once because it's so simple. The program is on cartridge – so it is quick and easy to load. Data can be stored on cassette or disk.

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64

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software

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SOFTWARE SPOTLIGHT

C16 games and American imports are just two groups of software to fall under our reviewer's critical eyes, this month.

INDIANA JONES
in the
LOST KINGDOM
The ultimate challenge. Nobody told INDIANA JONES the rules. And no one will tell you.
MINDSCAPE
64

Indiana Jones in the Lost Kingdom

★ ★ ★ ★
U.S. Gold
£9.95
CBM 64 + Joystick

INDY IS AFTER AN ARTEFACT – YOU don't know what it is or how to get it, but you do know that it is fabulously valuable. To get the artefact you must progress through six chambers, in each of which is a puzzle.

At first you are in a rocky seascape, which, surprisingly, has lifts between rocks. At each side of the screen is what appears to be a set of traffic lights. You are under attack from some creatures which look like Pterodactyls – at least, they are like all the ones I have ever seen. Do not despair, though, there is a way to turn them into butterflies!

Each of the other rooms possesses its own puzzle and, in each room, the joystick is used in a different way. You are given no guidance in this – it all adds to the challenge. You do know that there are dangers in each room, so you are likely to need all seven of the lives you are given. There are three difficulty levels, and on the higher levels everything happens much faster.

This is a very good and compulsive game. The sound is excellent and the graphics good, though rather fuzzy. Highly recommended. **P.R.B.**

Murder By The Dozen

★ ★ ★ ★
CBS Software
£17.95
CBM 64 (Disc)

MURDER BY THE DOZEN FROM CBS Software is an interactive game for 1 to 4 players. There are twelve murders to be solved, one at a time. If any of you have ever played the excellent Witness then you're half way there, only this is better!. By using your powers of deduction and collecting clues you have to decide 'who did it' and why. Included in the rule book are the twelve case histories, which should be read very carefully, and a pad of worksheets for you to record your notes and suspects etc. This worksheet also shows you a map of the town with all relevant places marked. You also need a book of clues and the solutions which can't be read simply (clever, these Yanks).

On booting up the disc, you're asked to input your name. The computer will accept anything up to Sherlock Holmes in length; being a ham I played as Marlow. You then decide the order in which you wish to tackle the cases. As all the murders are equally tough I plumped for No 1. The 1541 whirls into life and the chosen scenario is loaded into memory.

Everything is governed by a main menu. You can either talk to someone, examine something or move to a different location or, if you like, all three. But, as your final rating depends on how fast you finish the game, its wise to choose your options carefully.

As this game can be played by more than one player, CBS has devised a way of making your suspects' answers relate only to the person currently in play. Thus, you keep the information you've gathered secret from your opponents. On interrogating someone, their answers are shown on the screen as a series of numbers which relate to clues contained in the clue booklet. All you do is look up the relevant number and, hey presto, you have your information.

Once you have exhausted your enquiries, and have discovered the guilty party, you can then reveal all by reading the solution book and making sure your worksheet tallies in all respects. You finally declare your outstanding success to the computer, only to be told, as in my case, that you rate 'Befuddled Detective'!

This kind of program doesn't fall into any pre-defined slot; neither true arcade adventure, text or otherwise. I suppose it's intended for those who prefer to think their way out of a situation rather than blast it. I recommend it as a game just a little out of the ordinary. **M.T.U.**

Shoot the Rapids

★ ★ ★ ★

New Generation Software

£7.95

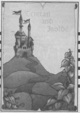
CBM 64

IT IS BECOMING MORE AND MORE difficult to produce a good original game but this slalom canoe simulation comes pretty near the mark.

The screen features a slalom course with a number of gates. The river scrolls vertically and the computer canoeist, mid-screen, must negotiate the gates or suffer time penalties at the end of the descent. True to life the river flows fastest in the middle but paddling in the slower waters near the bank can result in capsizing. Passing through the slalom gates is no easy task but joystick control helped with the now familiar waggle to paddle. The canoe behaves just like the real thing if you want to go left, it's right hand paddle down or in this case joystick right. Back paddling is also permitted by pressing the fire button which is particularly helpful when your canoe is jammed in at the bank.

The graphics depict the canoeist's actions well, whether paddling or sinking, and the ripples on the river are even shown. There are five progressive levels of difficulty with high scores being recorded for each level. Progressing from one level to the next requires beating a qualifying time and this will not be easy for the first few plays. But be patient as, later on, further hazards appear like motor boats and beavers. Shoot the Rapids is infuriating at first but once the skills of slalom canoe are mastered, the game justifies all its pre-release publicity.

R.M.



Black Thunder

★ ★ ★

Quicksilva

£7.95

CBM 64

ON AVERAGE, I MANAGED TO GET THIS game to load once in every three attempts, but it is a good little game. Written by Tony Crowther, the author of Loco, it is really just a rehash of Loco. The train has turned into a car, which is speeding along a road system. From above, this looks remarkably like a railway line.

The top two-thirds of the screen show a picture of the action, in superb graphics. The car runs along its track, periodically passing through tunnels, while under frequent attack from passing helicopters, tanks, guided missiles and UFOs. Ammunition is scooped up from the road, but if you collect too much you will explode. At the bottom of the screen is a bird's eye view.

You have three cars, and there are nine difficulty levels. At the end of each game a voice tells you your score, sounding like an American Dalek with laryngitis. This is enhanced if you have the Currah Speech Synthesiser, but is quite comprehensible without it. The hi-score is recorded, but without a table.

If you own Loco or a similar game you will not want this one. Otherwise, it is well worth buying.

P.R.B.

Tristan and Isolde

★ ★ ★

CRL Software

£8.95

CBM 64

FROM THE TITLE IT MAY BE DEDUCED that Tristan and Isolde is a German import. The cassette is accompanied by good looking instructions in scroll-like form in keeping with the game and, after a fast turboload, the screen offers a demo option.

The game itself is a graphic adventure but it seems to operate at the speed of a slow text type adventure. Naturally, I would not think of breaking into the code, but parts of the game, notably the block graphic characters, hinted at a basic program. Not a lot happens on screen until one or two key-press instructions are given from the options menu which is continuously displayed. Also shown is your current location with exits in 3-D type format, any artefacts such as food or weapons which can be collected and a window showing ground level exits from your current location.

Tristan, the hero, is guided by the player through the various rooms and up and down if he has the appropriate equipment. His object, as you may have guessed, is to rescue his beloved Isolde who has been imprisoned in a castle by the evil Wumper, a monster who appears from time to time.

True adventure, graphic or otherwise, this game is not. If you need an object to reach another location, the screen will tell you whilst Wumper appears randomly gobbling you up without so much as a reincarnation. The opening illustration of a castle and music produced courtesy of the 64 harpsichord promise much but, once in the quest, adventurers and arcadians alike may be disappointed. Tristan clonks about slowly sounding as though he were a clog dancer and, getting in tow with Isolde, he proceeds at an agonisingly slow pace.

The graphics include some nice touches; for example, each character has a faithful shadow but on the whole the available memory might have been better utilised speeding up the action. High scores can be entered on a ten name roll of honour but really the only time this is likely to be filled would be at a children's party.

Overall, the game is quite well produced if a bit ponderous but it is more of the children's cartoon variety than a buy for adventure gamers.

R.M.

Stellar 7

★ ★ ★ ★
U.S. Gold
£9.95 (cassette) £12.95 (disc)
CBM 64

ANOTHER AMERICAN TITLE BROUGHT to us by U.S. Gold. This has you as the commander of the Raven – a top secret futuristic tank. Your mission in the game is to destroy Gir Draxon the supreme Overlord of the Arcturan Empire.

Once this game has loaded, you are given a short menu of options. You should choose the mission briefing first. This is really the game instructions which also shows each of the enemies you will be up against during the game. Each enemy is displayed in superb 3D perspective vector type graphics. Each enemy is shown spinning in from the distance and then rotating once in full view. The overall effect is smooth and very realistic and just as good in the main game.

Choosing the play option presents you with another menu of game missions. These range from training missions right up to the hardest mission where you have to find and destroy Gir Draxon.

Once you have chosen your mission you are given further details on what you have to do and then you are in full control of the Raven. I recommend using a joystick as there are over eight keys to operate the Raven without mentioning the other special control features.

The game is very similar to the Atari game Battlezone. However, this is a well presented with good graphics and engrossing game play. The sound is a little feeble, but it's worth looking at if you are a Battlezone fan.

P.R.R.

Villain

★ ★ ★
Interceptor Software
£6.00
VIC 20 + 8K Expansion/Joystick

IT'S A HARD LIFE BEING A VILLAIN. ALL that running from policemen and jumping over obstacles. Not to mention head banging with bombs and throwing vacuum cleaners all over the place.

This new game from Interceptor takes you into the world of crime and shows it does not pay – at least, not all the time.

After pressing space to begin, you are told you must qualify in the 200 yard dash to begin your first job. There are around 24 jobs in this game. They involve running from a comical policeman, collecting jewels and safes and leaping over or vacuuming up obstacles in your path. Running involves the now usual joystick method – waggling it like crazy. (I reckon joystick manufacturers are sponsoring this type of game!) However, Interceptor have tried to save us from becoming worn out by all this strenuous excercise. With the main jobs there are bombs floating above the villain's head. Jumping up and hitting one of these in the right place gives our criminal a boost in his adrenalin. Just push the joystick left and watch him run. But this is only temporary.

This is a good game with large clear graphics and worthy of a higher rating. Unfortunately, it contains a nasty bug. Usually it occurs around the second job: you are running along when suddenly you find a blank screen and the 'READY' message. Hopefully Interceptor will have this sorted out and then they may have a VIC winner on their hands.

P.R.R.

Skyline Attack

★ ★ ★
Century Software
£7.95
CBM 64

IMAGINE YOURSELF IN THE YEAR 2000, when all the world has been conquered by aliens except for London, and they're even after that! Your task is basically very simple – to free the known world, by flying around and killing all the aliens.

Alien spacecraft, as everyone knows, are very strange things, varying in shape from oversized frogs to wriggly green clouds. They cannot shoot at you, but they fly kamikaze missions, trying to collide with your plane. When you shoot an alien it sometimes drops a fuel pod, which you can collect and use. If you shoot a fuel pod it turns miraculously into a crystal, and each crystal you collect takes you forward to the next phase of the game.

The graphics are excellent, especially the skylines of the cities you fly over, which scroll very smoothly. The sound effects are adequate, though nothing special. The game is challenging and the pace is fast and furious, particularly in the higher levels. After wave 10 you can no longer fly low.

The game is similar in essence to Neoclyps, but much faster. A nice bonus is a little game called "SSSNAKE", to play while the main game is loading.

P.R.B.

F-15 Strike Eagle

★ ★ ★ ★
U.S. Gold
£14.95 Disc/Cassette
CBM 64 + joystick

F-15 STRIKE EAGLE, BY MICROPROSE, simulates the fighting and tactical capabilities of this awesome fighting machine. The program makes no attempt to simulate the 'flying' aspects in as much as there are no take off and landing stages, as there are in Fighter Pilot for instance. The emphasis has been placed on providing the simulation with airborne radar, cannons, air-to-air missiles, bombs, decoy flare and electronic jamming devices. All these, plus your skill and strategy, are required if you are to succeed in your mission.

My first reaction was that the screen was cluttered and I didn't know what was happening. You need to remember which key does what – quickly. The 36 page manual explains all of this in great detail and it is essential information. Any delay could result in a SAM missile homing in on the heat of your exhaust. Not a pleasant experience!

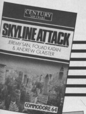
However, after much reading and more practice, the cockpit display became clearer and the program became far more enjoyable. Roughly half of the manual is devoted to the tactical and weapon systems and the other half to flying the aircraft. Flying is fairly easy with the aid of a joystick. This allows one to concentrate on the main job, which is to bomb as many missile sites and airfields as possible. In between bombing runs you have to shoot down the odd enemy jet and protect yourself against the missiles which will be launched at you. How you tackle this depends on your strategy. For instance, you could fly high to reduce the effectiveness of the SAM missiles or fast and low under the enemy radar. If your radar detects an enemy aircraft you have the choice of closing and using the cannons or firing one of two types of air-to-air missiles.

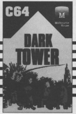
There are four skill levels with the lowest, arcade, keeping a horizontal horizon even when the aircraft is in a turn. There are seven missions to fly with each getting progressively more difficult. It is with the scenario of these missions that I have some misgivings. For instance, they are located in Libya, Egypt, Vietnam, Syria and Iraq. The program is intended for home amusement only (at least I hope it is otherwise we're in trouble). I would much prefer the scenarios to be ficticious rather than real geographical areas. I wonder if the Soviets have a game called Raid Over Washington?

That apart, this is an excellent program with good 3D graphics. Enemy aircraft are shown as 'wire' shapes, as they are redrawn to show perspective, so they lose their impact (sorry!). Sound is well used for the various engine and weapon noises. I particularly liked the sound of the electronic jamming device.

F-15 Strike Eagle is a very well documented strategy flight simulator and should keep you entertained for many hours. The Novaload program loaded in just over 4 minutes but this did not seem so long as one is entertained with the customary US GOLD screen and stirring U.S. music. Look out Colonel G. Here I come!

J.F.





Dark Tower

★ ★
Melbourne House
£7.95
CBM 64

IF YOU WERE GIVEN A GAME CALLED Dark Tower and, on reading the instructions, found out that the guardian of the tower had turned you into a mutant and imprisoned you in a series of chambers and that, to overcome the defence systems, you had to collect jewels and deliver them to the guardian which in turn would get you into the final chamber where the secret of the tower would be revealed, then you'd think you had another mystic adventure game right? Wrong, it's yet another Manic Miner derivative. I can't think of anything we need less, unless it's another Frogger.

After about three minutes of Pavloda loading, side two eventually loaded, although side one refused at all attempts. You are given the option of either seeing the instructions or playing the game. On completing each room, a letter is revealed which will solve a puzzle and allow you to win another Melbourne House game.

Playing the game is an experience in 'deja-vu'. You control a little man shaped like an egg, and have to collect jewels which are hung on the walls of each screen using platforms and ladders as required and jumping over the moving 'guardians' as you go. If you touch these or the platforms in the wrong order you're dead.

As with other Melbourne House games, the screens are nicely drawn, without being too flash. In fact, some are quite sparse.

The little man moves well enough and all screen changes are swift. The music is cheery but gets annoying after a while.

You start with five lives and will probably need them all; it isn't easy. You'll also need more devotion to this type of game than I have to see the last screen; even for a free game I couldn't be bothered to go more than ten screens, there simply isn't the variation to maintain interest.

If you want a Manic Miner game, get the original.

M.T.U.

SOFTWARE SPOTLIGHT

Games Pack 1&2

★
Melbourne House
£7.95
C16

A REVIEWER'S LOT IS NOT A HAPPY one! How can you be critically accurate and at the same time fair to the programmer when asked to review budget games packs by one of the best software houses in the country, Melbourne House.

These two cassettes each contain fifteen of the simplest and earliest type of game. All appear to be written in BASIC and, consequently, are not fast and furious but weak and feeble.

Many of the games are of the 'number jumble' or 'criss cross word' type. Add to those the obligatory hangman and blackjack and you end up with a collection of real tedium.

The average loading time is somewhere under two minutes and the instructions for each game occupies about three lines. No sound is used in any of the games and, as far as I could tell, all the graphics came from the Commodore keyboard's character set. No one game stands out from the others.

Software for the C16 is very scarce at the moment so any new games will be bought virtually at face value. If fifteen cheap games is what you want then these tapes will fit the bill, but do remember that you will get fifteen games that could easily be bettered by listings in Your Commodore. These game packs offer quantity not quality; the C16 is capable of much more.

M.T.U.

Monster Maths

★ ★ ★
Shards
£6.95
CBM 64

FINDING A GOOD COMPUTER PROgram which teaches maths as well is a tall order, so coming across a cassette containing not just one game but five was a bonus. Each game deals with a different mathematical problem in a way which makes them interesting to play.

The game starts with a menu which not only gives you the option to play one of the games but allows you to choose the level you wish to play at (easy, harder, difficult) or to change your name or to check your overall score. You can choose the game you wish to play while having fun and improving your maths skills at the same time.

The first game, 'Rectangles', covers the relationship between two rectangles. The player has to decide how many times one shape will fit into the other. As well as the original choice of difficulty you are given a further choice of easy or more difficult questions in this section.

'Times Tables' is a teach and test program which should ease the most reluctant schoolchild through learning their multiplication tables. Even the more unusual tables, i.e. 13, 14, 15 are included.

"Arithmetic' comprises a set of twenty questions. The player can set his own parameters, i.e. addition, subtraction, multiplication, division or a combination of all four and decide on the difficulty level required. In this program you are allowed another try when you answer incorrectly. After two attempts the machine gives you the correct answer and suggests you move on to the next question.

'Mystery Numbers' gives you a number and shows you the numbers combined to make it. Your task is to show the sum used to reach the total using addition, subtraction and multiplication. In the 'difficult' mode this section can be very testing.

In the final game, 'Monster Maths', you are asked to give the name of a friend. Once this is done the monster offers a challenge: get three sums right in thirty seconds and your friend is eaten, get them wrong or take too long and you get eaten. The animation in this section is very good and amusing.

Overall, this is a nice selection which should appeal to a wide range of children.

M.W.

Upper Gumtree and Professor Blowitovitz

★ ★ ★
Richard Shepherd Software
£6.50
CBM 64

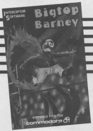
UPPER GUMTREE IS A DETECTIVE adventure with graphics, on a giant scale. Your task is to foil the mad Professor

Blowitovitz, who plans to take over the world. He has already done some dastardly deeds, such as making people's noses glow in the dark and causing Tuesdays to disappear altogether! You are helped (and hindered) in your task by various other characters, especially Emma and Wally. You can communicate with them, but only with some difficulty. Emma is helpful, but Wally is a pain, who steals everything he can see.

The game is written in machine code, and features hi-res pictures, which are drawn very quickly and sometimes give you clues, unlike many other adventures. Another good point is that commands can be strung together using the '+' symbol, enabling you to return speedily to an earlier position. I also like the fact that it is easy to map, following the rules of geography, while other games sometimes cheat.

There are many unexpected hazards, and although the vocabulary is somewhat limited it is an amusing game to play, and excellent value for money. The scenario is unusual, with surprising things happening, so adventure enthusiasts will definitely want this one for their collections.

P.R.B.



Stellar Wars/Blitz
★ ★
Commodore
£5.99
C16 + Joystick

COMMODORE'S FIRST OFFERINGS FOR The C16 are also the oldest.

The first game on the tape is Stellar Wars, a space fighter game of inter-galactic proportions, but don't get too excited. The screen is quite impressive: the central view is from the front of the space fighter and most of the screen is the standard black dotted with white stars. The computer display panel is at the foot of the screen. This gives warning of an enemy 'ON TARGET' or of a state of 'ALERT'. The laser temperature meters are also at the foot of the screen: too much firing and they overheat and jam, not funny as you only have 100 seconds of play per game. In the centre of the screen are the sights, the idea being to align the sights on an approaching enemy fighter and destroy it with your lasers. In practice this proved difficult as the smooth scrolling screen moves very fast even with a slight touch of the joystick.

The graphics are adequate with only one type of enemy fighter to destroy, albeit in different colours. The sound from my TV was very harsh and needed to be turned down considerably in order to enjoy the game comfortably. The best feature of the game is the silky smooth scroll of the screen.

The second game is Blitz. What can one say about a game as old and easy as Blitz? Your aim is drop bombs on skyscraper buildings to try and flatten a landing strip. The buildings are randomly made up from Commodore's block graphics and the plane is a very dodgy looking affair.

Hit the space bar to drop a bomb once you're over a building and that's about it. Very poor graphics, worse sound and little user participation.

The two games for the price of one just manages to be value for money. Stellar Wars is the better of the two.

M.T.U.

Bigtop Barney
★ ★ ★ ★
Interceptor Software
£7.00
CBM 64

AT LAST, A HALF-DECENT new arcade game to review and just when I was beginning to despair.

Barney is the star of this particular circus scenario which is split into four separate acts. You choose one of the four game plays, each of which is a variation on a

In Act One, Barney takes on a bit of tight rope walking. It's a 100 metre excercise and to get to the other end he has to avoid a number of obstacles, the 'drat' factors. Points are gained for jumping over chimps, through fire hoops and grabbing money bags which turn into golden eggs as the difficulty level increases.

In Act Two you must guide Barney up and down a series of platforms avoiding the evil Otto and collecting ten balloons.

Next, Barney moves on to his unicycle trick and you have to guide him through an assault coarse of platforms to get to the other end. The finale sees him

The finale sees him testing his acrobatic skills on the trampolines, swinging ropes, platforms and ladders to gather six special keys so that you can let Chester the lion cub out of his cramped cage. You have to do all this and avoid the flame throwing tactics of the fearsome fire eaters as well.

As I said, despair was beginning to set in, now it seems that addiction is!

K.M.

SOFTWARE SPOTLIGHT

Hyper Biker

★ ★
P.S.S.
£7.95 (cassette)
CBM 64

THIS GAME CLAIMS YOU CAN ENJOY the thrills, spills and skills of BMX competition racing. There are six events for you, and up to three friends, to take part in. These include straight, obstacle and wheelie races. There are also long and high jump events. The last event is the bunny hop.

The game loads very quickly from tape and you are presented with an event table. You can then enter all the names. If you're playing alone, the computer is your opponent. There are also three ways of controlling your bike: two types of joystick control or keyboard control, although the latter method is not recommended.

The first event is the straight race. Pressing the space bar starts the race. If you have played any of the Olympic games you will be familiar with what happens next. Yes, it's waggle the joystick like a looney time! Well, it's either that or bash your poor old 64's keyboard like crazy. This madness goes on for up to 60 seconds. You must qualify in under 47 seconds. This is very hard to do and if you fail you must try again before you can get on to the next event.

The graphics and sound are good. The game is not so good. It seems to be aimed at BMX owners, but I don't think it's any substitute for the real thing.

P.R.R.

Crazy Golf

★ ★
Commodore
£5.99
C16

PERHAPS THIS ISN'T ST. ANDREWS BUT at least you can play this golf without getting wet or up at the crack of dawn; all you need is a C16 and a lot of patience.

Your task is to complete 18 holes on the craziest golf course you will ever encounter. Each hole has its own unique set of obstacles which you must overcome or use to your advantage. Every hole is given a 'par' rating and you must endeavour to 'hole out' in par or less.

The main area of the screen shows as overhead display of the hole in play, complete with 'block graphic' obstacles.

Playing the game is easier than it looks at first sight. Down the right hand side of the screen is the 'power of shot' meter; the longer you make the yellow bar the harder you will strike the ball. Above this is the direction indicator; you may hit the ball in the direction of any one of the eight compass points. To play, just choose the direction and power and then hit the ball, easy!

Crazy Golf's biggest advantage is playability. After only a little practice, I progressed quite quickly.

But it loses points on the limited use of sound, the absence of a two player option and the fact that 18 holes get boring after a while; nine holes with better graphics would have been an improvement.

M.T.U.

Harbour Attack

★
Commodore
£5.99
C16 + Joystick

HARBOUR ATTACK IS AN EXCEPTIONally annoying game, since I couldn't progress beyond screen one of a three screen game. This might be due to my ineptitude at the game (although four of us have tried) but it is more likely that the margin of error has been fixed slightly too low. Whatever the reason I know I have no wish to try this game again.

The plot sounds exciting; captain a submarine through dangerous waters, run the gauntlet of mines and anti-submarine aircraft, avoid nets and eventually win your way through to the enemy harbour where you can torpedo and sink the cargo. If it sounds good, don't be fooled.

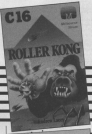
Once powered up, the initial screen is very disappointing: a poorly depicted submarine controlled by the joystick with several rows of mines going up and down at a set pace. Between these mines are the submarine nets with holes just large enough for your sub to pass through.

Your task is to avoid the drifting mines and pass through the nets without touching anything on the way: simply in theory, too difficult in practice. According to the instructions, in the second stage you are under attack from ships, which try to depth charge you, and aircraft, which bomb you from above.

In the final part, you fire torpedoes at the cargo ship in the harbour, in similar fashion to those torpedo games seen in all good arcades.

This game was a poor attempt at a nice scenario; both the sound and graphics were well below the capabilities of the C16. I should wait for better games than this to come along.

M.T.U.



Roller Kong
★ ★ ★
Melbourne House
£5.95
C16 + Joystick

ROLLER KONG FROM MELBOURNE House is still Crazy Kong or Super Kong or any other Kong by another name. Just in case someone somewhere hasn't seen a Kong game, I'll explain.

At the top of the screen is a large angry gorilla; he's Kong. He has kidnapped your girlfriend and is holding her hostage at the top of a high building. You have to rescue her by climbing a series of ladders and platforms until you reach the girl. Kong meanwhile is trying to hurl barrels and fireballs at you which you must avoid or jump over. Because every game has to have a score, you pick flowers on your way to the top, and smash little monsters, 'SPINKS', to bits with an axe.

Once you reach your girl in the first screen, guess what happens? Yes, you do it all over again on screen two, only this time the ladders have been replaced with lifts.

As an early offering for the C16 it's quite a good effort; the sound is a little limited and rough in places, but the graphics are good, with a very nice animated gorilla. The game is addictive: the first screen is quite easy but the game gets harder and harder.

The little figure seemed a bit slow to respond to the joystick, but then that might just be an excuse for my poor score. You could buy worse than this good and faithful reproduction of Kong.

M.T.U.

Blue Max
★ ★ ★ ★ ★
U.S. Gold
£9.95 (cassette) £14.95 (disc)
CBM 64 + Joystick

HAVE YOU EVER WANTED TO FLY AN early wartime biplane over enemy territory and blast and bomb everything in sight? Well, Blue Max is the game for you.

You are the pilot of a small plane equipped with a limited supply of bombs and a machine gun. Your mission is to destroy three main buildings in the enemy city. Before you even get to this city you must fly over enemy countryside bombing priority targets such as buildings, ships and road vehicles. There are also enemy planes to shoot out of the sky during ariel dogfights. So far I have only managed to get to the enemy city once.

Your plane can sustain so many direct hits from ground to air missiles before you end up dropping out of the sky. You can, however, land now and again to refuel and undergo repairs.

There are a number of game options including three difficulty levels and two types of joystick control. The graphics and diagonal 'Zaxxon' type scrolling are exceptionally slick and very smooth. You really get a great sense of flying. Sound is also very realistic.

I soon got the hang of take-offs and landings and found myself totally addicted to this great game. It's highly enjoyable and a great way to unwind and release those violent urges without harming anyone. Check it out at your local computer store soon.

P.R.R.

Psytron
★ ★ ★ ★
Beyond
£7.95
CBM 64

PSYTRON HAS BEEN AVAILABLE FOR the Spectrum for some time and now Beyond have seen sense. The 64 version of this space-base defence simulation, naturally, ought to be superior.

The Psytron is a computer guarding the human colony on the Betula 5 installation and the player takes on the role of the defence computer marshalling ground and air defences and delegating the human resources to carry out repair work on the various parts of the base. The graphics are good and a beautifully detailed scrolling view of the base can be achieved through 360 degrees.

A sixteen page manual will give some indication of the size of this game with full instructions and hints for each of the five levels. There is a sixth level, the Final level, but this can safely be ignored for the first few months play. Each level is accessed from a menu but it is as well to start at level one as other features of Psytron's defences are added as levels progress so that various skills can be built up gradually. The screen is filled with information on the base status throughout the game, alien spacecraft, gunsights and a view of the base occupying the top half of the VDU. In the lower half there are damage reports, missile status, resources reports, two radar functions and a neat window used for chasing and zapping any aliens who may have landed.

The game has too many features to cover in a short review – it's action packed, it's strategic and it's difficult. High scores? Forget it, your very own service record for all levels can be loaded and saved for a number of tries at each level. For all of this, the price is a snip.

R.M.

Printer problems? Disc drive dilemmas? Whatever your question, we'll try to answer it.

INPUT

INPUT

Could you tell me how to program the 'Function Keys' on my Commodore 64. I have bought 2 books on the machine – "Mastering the Commodore 64" and "The Complete Commodore 64"; the latter actually has the words 'function keys' in its index. But, the said keys aren't mentioned. Page 63 states: "..the Commodore function keys aren't as simple to program as those on the BBC micro." It tells you to look at Part 6 (a section on machine code programming). I looked at part 6 and they weren't mentioned. The dreaded keys are not mentioned at all in the first book. "The Programmer's Reference Guide" is as useless as the other two books. Are "Function Keys" naughty words??
G.A. Hatton
Hampshire

OUTPUT

People have been punished for saying less – such as "are Commodore Manuals error free?"

We gave an answer to a similar question in our January 1985 issue. Simply, you cannot program the function keys from BASIC but have to use a machine code patch.

INPUT

After reading your article on moving a character, I noticed that line 100 (POKE 2040,240) displays three vertical lines. Please can you tell me how to move my own sprite character.
Mark Hewlett
London

OUTPUT

It is very dangerous to just select a statement like this and try it in direct mode. The statement only has any sensible effect when used in the context of the rest of the program. You can use the same article to move a sprite or a character.

INPUT

At last, I thought, a super magazine with high quality printing and graphics that can be read. Then January's edition arrives and the graphics are totally illegible – they all blur into long black blobs. I thought I'd picked a bad copy. But February's was just as illegible.
R.G. Marks
Gloucester

OUTPUT

Sorry Mr. Marks, and all you other readers who've complained about the poor graphics. However, commencing with the February issue, we have inserted REM statements before each line which includes graphic symbols. These REM statements are merely a guide, indicating what the following graphic symbols are; there is no need to type them in. We hope this takes the pain out of typing in long listings.

INPUT

Having just read the March issue of Your Commodore, I was rather disappointed to see a software chart for the top 20 Commodore 64 games and the top VIC 20 games, indicating that the top game for the VIC 20 was 'Perils of Willy'.

I recently bought this game for my son, only to discover that he cannot play it on his VIC 20 as he has no expansion. I think it is wrong that people should be misled in this way. Tapes should carry some indication that an expansion RAM is required, as I'm sure we are not the only family to have made this mistake and to have games which cost a lot of money lying unused.
Morag Paterson
Perth

INPUT

I have heard the term 'sluggish' used to describe the 1541 disc drive. Please can you tell me, maybe by comparison with other drives, just how sluggish the 1541 is.

In one of your replies on the Input/Output page, you mention 'IEEE devices', including Commodore single and twin disc versions. Does this mean that Commodore make these drives for use with these interfaces? Also, do the drives use the same type and size of disc as the 1541, and will they load typical 64 software from disc?
Mark R. Jones
Blackpool

OUTPUT

Firstly, the main problem with the speed of the 1541 is the serial interface between it and the computer. Secondly, comparison with drives suitable for other computers are of little interest as they are not compatible. Comparisons between the 1541 and IEEE drives are possible but the extra cost of these drives put them far out of the reach of most users.

Commodore currently make the 8520lp 2 megabyte twin disc drive retailing at £895 and the SFD1001 1 megabyte single disc drive retailing at £495.

These drives and all other IEEE devices require an IEEE interface if they are to be used with the Commodore 64. They use double sided, double denisty discs whereas the 1541 requires only single sided, single density discs. The drives will load any software that has been properly created.

OUTPUT

INPUT

For many months, I have been searching for a printer for my VIC 20 which would suit my needs. Unfortunately, I haven't found a suitable printer and have, therefore, noted the specifications I need below. I hope you may be able to suggest a suitable printer.

a) 9 x 9 pin, dot matrix impact printer; bi-directional logic seeking.

b) User defined graphics, true descenders, enlarged print giving double height and double width characters.

c) Should be easily connected to VIC 20 by Centronics or RS-232 interfaces (preferably RS-232)

d) Tractor and friction feed – fairly fast, i.e. 30-50 cps; paper width range of 4" to 10" giving up to 80 columns.

e) Most important – price should be £100 to £400.

f) Optional extras enhancing the printer: self-test, addressable dot print position, italics, condensed print, 4 colours, cheap paper and ribbons.

M.J. Davies
Dyfed

OUTPUT

Finding the perfect printer at the price of a cheaper model is virtually impossible but the newer printers coming on to the market do seem to provide better value. I assume you have looked at all of the most common printers and so I will recommend a new machine from Datac Limited. They have brought out two new printers, the smaller of which may be of interest to you. This is the Panther DX109 and some of its features are:

10 or 12 cpi print density; 80 or 96 characters per second; enhanced and condensed print; 9 pin head – character matrix is 9*9 dots; Dot addressable graphics; 1152 byte input buffer; Standard Centronics parallel interface; Optional RS-232 interface; tractor and friction feed; bi-directional logic seeking.

The price is £278 and you can get one of these through Ilford Computer Center – telephone them on 01-514 3340.

INPUT

I bought a Commodore 16 for my children at Christmas. Have I purchased something which is already obselete, or is it so new that there are no games or articles for it? I can't find any tapes for this computer locally, and when I travelled to the nearest big town, which only has one shop stocking C16 games – they only had a selection of 5.

Mrs. M. Brunt
Somerset

OUTPUT

Because the C16 is a new machine, there is not a wealth of software yet available for it. But things are beginning to look up. There are some C16 reviews in this issue and we have a C16 games special in our next issue as well as a C16 Assembler to type in.

T·H·E BASIC F·A·C·T·S

Using the basic information given last month on using your computer as a filing cabinet, A.P. and D.J. Stephenson now show you how to build filing programs through a collection of subroutines.

PART 8

THIS MONTH WE SHALL cover some general purpose subroutines which should be useful to you as building bricks if you decide to develop your own programs. As far as possible, we shall restrict the discussion to cassette tape files because the majority of readers may not yet have invested in a 1541 disc drive. It is not expected that you follow the subroutines strictly to the letter. No doubt you will want to introduce some variations and, perhaps, extra cosmetic touches such as colour emphasis for headings etc. Line numbers have been chosen so that, if you use all the subroutines, there will be no clashing. Furthermore, they are all low enough to allow room for a short calling program, via a menu. We say, 'short' because the subroutines will do most of the donkey work. The main task left is to provide the menu display and the ON GOSUB selection mechanism. (Refer back to Part 6 of the series.)

The subroutine have been introduced in logical, rather than line number, order. However, it is suggested that you finish up with one long program which can then be saved on tape under one composite name, such as 'LIBRARY'. To help you in this, the subroutines should be entered in the following order:

Subroutine 8.3 Create file: 1000
Subroutine 8.8 Load file: 2000
Subroutine 8.7 Save file: 3000
Subroutine 8.5 Display file: 4000
Subroutine 8.4 Add records: 5000
Subroutine 8.6 File name: 10000
Subroutine 8.9 Record search: 14000
Subroutine 8.2 Press any key: 15000
Subroutine 8.1 Input validation: 25000

The round-figure starting numbers, given at the right, should be used in the GOSUB statement rather than the first REM line which is simply the title. The lines are deliberately spaced well apart in order to allow extra subroutines to be inserted later. To use the LIBRARY tape as a basis for a full program:

1. Load LIBRARY tape
2. Keep record of the subroutine titles and round-figure starting lines.
3. Develop a program, using the vacant line numbers from 10 to 999, which displays a menu for calling the subroutines. Include any initialisation and pre-assignments necessary.
4. Add some colour commands or other cosmetic aids for tarting up the final project. Avoid bizarre effects – they can detract from rather than enhance the appearance.

Variable names

In the subroutines the following variable names are used consistently:

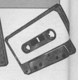
A$((F,R)=element of the two-dimensional array representing the main file data
FS%=maximum file size (maximum number of records allowed in file)
FL%=current file size
N$=file name
NF%=number of fields in record
F=particular field number
R=particular record number
S%=selected menu option number
K$=general purpose variable. Used particularly in input routine
L%=main file length
F1%=file status flag. F1%=1 if file already loaded.
SS=bottom line of display
S=top line of display
SL%=subfile length
CH%=number of characters allowed in field.
LC and LT are other general purpose variables
L$ is a string of 39 characters for drawing a line on the screen, using CHR$(99).

Input routine

Creating and maintaining files can be a time consuming task, most of which will be spent at the keyboard. In view of this, a friendly input routine is particularly important. Replying on a bare INPUT statement is not good enough because no allowance is made for human error. Subroutine 8.1 will serve as our first building brick for inputting string data.

```
Subroutine 8.1

24999 REM INPUT VALIDATION
25000  K$="":INPUT K$
25010 IF K$="" THEN 2500
25020 IF LEN(K$) > CH% THEN K$=LEFT$(K4,CH%)
25030 RETURN
```



A check is made for the null-input condition (pressing RETURN before data) and also the number of characters received. Any excess characters are truncated without warning. Although the machine allows 255 characters per string, there will usually be a much lower restriction in a practical file due to display limitations. In fact, you should allow a maximum of 19 characters otherwise the files won't fit in properly when the file is later displayed.

Before calling:
Assign maximum character limit to CH%
On return, data is left in K$.

Hold display subroutine

Subroutine 8.2 will often be needed when execution must be suspended until a key is pressed.

```
Subroutine 8.2

 14999 REM PRESS ANY KEY SUBROUTINE
 15000 PRINT:PRINT"PRESS ANY KEY"
 15010 GET K$: IF K$="" THEN 15010
 15020 RETURN
```

Create new file subroutine

When creating a new file, the first items of information required from the keyboard would be:

1. *File size*. That is to say, maximum number of records allowed (FS%)
2. *Number of fields in record.* (NF%)

Once these two items have been obtained, the array can be dimensioned with:

DIM A$(NF%,FS%)

3. *Field headings*. These can be sorted in the 0 record slot of the array in the form A$(F,0), where F is the particular field number. Thus, field 1 can be stored in A$(1,0), field 2 in A$(2,0) and field n in A$(n,0). This is a neat and convenient dodge for storing the heading information providing, of course, the first record number is deemed to be Record 1 instead of Record 0.

The file will then be ready to receive records. Subroutine 8.3 is based on the requirements outlined above.

```
Subroutine 8.3 Create file subroutine

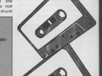
 999 REM CREATE FILE SUBROUTINE
 1000 PRINT CHR$(147)
 1010 PRINT"ENTER FILE SIZE (NUMBER OF RECORDS)
 1020 INPUT FS%
 1030 IF FS%<1 THEN 1010
 1040 PRINT"ENTER NUMBER OF FIELDS (2-10)"
 1050 INPUT NF%
 1060 IF NF%<2 OR NF%>10 THEN 1040
 1070 NF%=NF%-1:DIM A$(NF%,FS%)
 1079 REM
 1080 PRINT CHR$(147)
 1090 FOR F=0 TO NF%
 1100 PRINT"ENTER FIELD HEADING";F+1
 1109 REM INPUT VALIDATION SUBROUTINE
 1110 GOSUB 25000: A$(F,0)
 1120 NEXT
 1129 REM
 1130 F1=1: REM FILE STATUS FLAG
 1140 RETURN
```

Note the call at line 1110 to our earlier subroutine which is an example of nesting. Restricting the number of fields to a maximum of 10 seems reasonable to us but line 1060 can easily be adjusted to allow more fields. The blank REM lines serve to demarcate submodule boundaries and are given spooky line numbers so they can be erased without fear.

Add records routine

Subroutine 8.4 can be used for adding records to a file, once it has been created.

Before each record is entered, line 5000 checks that the number of records has not exceeded the maximum allowed by the DIM statement at the time the file was created. Records can be added, one after the other until the operator types EXIT. Note that the record number is reduced by 1 after receipt of EXIT because it is not a valid record. Because the number of records which will be added at each section is unknown, the loop must be controlled by incrementing the record length (L%) each time round instead of using the customary FOR/NEXT loop.



Display file subroutine

After entering records into a file, it is customary to view the file on the screen, either for interest or to check that the records have actually gone in. Displaying a file on the screen presents problems. Suppose we want the fields to be displayed horizontally and the records vertically. The screen width is only 40 characters so only one or two fields of the record can be displayed at once. The limit of 25 lines also imposes a limit on the number of records which can be displayed at one time without scrolling. To overcome the horizontal limitation, the following subroutine allows only two fields of each record to be displayed at one time. The first field of the record (the key field) is permanently displayed at the left hand position. The other fields can be rotated into view, one at a time, to occupy the right hand position. This is achieved by using the 'L' key to rotate left and the 'R' key to rotate right. If the display is rotated beyond the boundaries of the fields, wrap-around action occurs. Only a 'page' of 18 records come into view at a time, but other pages can be scrolled

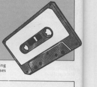
```
Subroutine 8.4

 4999 REM ADD RECORDS SUBROUTINE
 5000 PRINT CHR$(147):IF L%>=FS% THEN PRINT"FILE FULL":GOSUB
15000:GOTO 5120
 5010 L%=L%+1
 5020 PRINT"TYPE (EXIT) TO FINISH ENTRY OF RECORDS"
 5030 PRINT
 5040 PRINT"RECORD NUMBER ";L%
 5050 PRINT:PRINT:F = -1
 5060 F=F+1
 5070 PRINT A$(F,0):REM FIELD HEADING
 5080 GOSUB 25000:A$(F,L%)=K$
 5090 IF A$(F,L%)="EXIT" THEN L%=L%-1:GOTO 5120: REM EXIT SUBROUTINE
 5100 IF F<NF% THEN 5060:REM ASK FOR NEXT FIELD
 5110 IF L%<FS% THEN 5000:REM ASK FOR NEXT RECORD
 5120 RETURN
```

into view, upwards or downwards, by means of the 'U' and 'D' keys respectively. Pressing the space bar at any time will cause a subroutine exit.

Subroutine 8.5

```
3999 REM DISPLAY FILE SUBROUTINE
4000 C=1:S=1
4010 PRINT CHR$(147):PRINT"PRESS SPACE BAR TO EXIT DISPLAY"
4020 PRINT L$:REM DRAW LINE
4030 PRINT A$(0,0) TAB(20) A$(C,0)
4040 PRINT L$:SS=S+17
4050 IF SS<FL% THEN SS=FL%
4060 R=S TO SS:PRINT A$(0,R) TAB(20) A$(C,R):NEXT
4070 GET K$:IF K$="" THEN 4070
4080 IF K$=CHR$(32) THEN 4180:REM EXIT
4089 REM ROTATING AND SCROLLING
4090 IF K$="L" THEN C=C-1
4100 IF K$="R" THEN C=C+1
4110 IF K$="U" THEN S=S-18
4120 IF K$="D" THEN S=S+18
4130 IF C<1 THEN C=NF%
4140 IF C>NF% THEN C=1
4150 IF C<1 THEN S=(INT(FL%/18)*18)+1
4160 IF C<NF% THEN S=1
4170 GOTO 4010:REM END OF LOOP
4180 RETURN
```



After displaying the 'Press space bar to exit display' message, a line is drawn using L$. (L$ will need to be assigned near the top of any program which uses the subroutine – 'List of variables' above.) Next to appear on the display is the heading of the keyfield in A$(0,0) and field 1. Field 1 is the first to be displayed because C was initialised to 1 in line 4000. Subsequently, both the field heading and the record fields will change in response to the L and R keys.

File name subroutine

Before a record can be stored, the user must choose a file name. This could be included in the subroutine used to store the file but it is not good practice to include too much in one subroutine. Separating individual functions increases flexibility.

Subroutine 8.7

```
2999 REM SAVE FILE SUBROUTINE
3000 GOSUB 1000:REM FILE NAME
3010 OPEN 1,1,1,N$
3019 REM SAVE FILE CONSTANTS
3020 PRINT#1,FS%:PRINT#1,NF%:PRINT#1,FL%
3029 REM SAVE FILE ARRAY
3030 FOR R=0 TO FL%
3040 FOR F=0 TO NF%
3050 PRINT#1,A$(F,R)
3060 NEXT:NEXT
3070 CLOSE1
3080 RETURN
```

Subroutine 8.6

```
9999 REM FILE NAME SUBROUTINE
10000 PRINT CHR$(147)
10010 PRINT"ENTER FILE NAME"
10020 GOSUB 25000:REM INPUT VALIDATION SUBROUTINE
10030 N$=K$
10040 IF LEN(N$>16 THEN PRINT"TOO LONG":GOTO 10010
10050 RETURN
```

Subroutine for saving a file

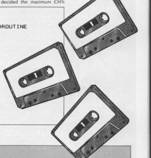
Files can be saved on disc or tape but, as explained in Part 7 of this series, the OPEN statements will be different. The following subroutine will assume cassette tape.

The file is first opened for writing. Note that the file constants are saved before the file array is saved by means of the double FOR/NEXT loops.

Subroutine for loading a file

The subroutine for loading back a file is almost the mirror image of the one for saving.

```
Subroutine 8.8
 1999 REM LOAD FILE TO TAPE
 2000 GOSUB 10000: REM FILE NAME SUBROUTINE
 2010 OPEN 1,1,0,N$
 2019 REM READ IN FILE CONSTANTS
 2020 INPUT#1,FS%,NF%,L%
 2029 REM
 2030 DIM A$(NF%,FS%)
 2039 REM READ FILE ARRAY
 2040 FOR R=0 TO L%
 2050 FOR F=0 TO F%
 2060 INPUT#1,A$(F,R)
 2070 NEXT:NEXT
 2079 REM
 2080 F1=1:REM FILE STATUS FLAG
 2089 REM
 2090 CLOSE1
 2100 RETURN
```



The file is first opened for reading. When it is read in from tape, the file constants must be read first. That is to say, the current number of records (L%), the number of fields in each record (NF%) and the maximum file size (FS%). This is needed both for dimensioning the array and for setting up the parameters of the FOR/NEXT loops needed for reading in the array. Lastly, the file status flag (F1) is set to 1, indicating to a program that a file is resident.

Subroutine for searching

Different filing programs vary in the number of processing options but all, without exception, will include the ability to search a file for a given record and display it in isolation. The following subroutine will find the record on being given the keyfield.

```
Subroutine 8.9
 13999 REM RECORD SEARCH SUBROUTINE
 14000 PRINT CHR$(147)
 12010 PRINT"ENTER KEYFIELD OF RECORD"
 12020 GOSUB 25000; REM INPUT VALIDATION
 12030 F2%=0
 12039 REM SEARCH FOR RECORD
 12040 FOR R=1 TO FL%
 12050 IF K$=A$(0,R) THEN RF%=R:F2%=1
 12060 NEXT
 12070 IF F2%=0 THEN PRINT"RECORD NOT IN FILE": GOSUB 15000:REM PRESS
ANY KEY SUBROUTINE: GOTO 12120
 12070 REM DISPLAY RECORD
 12080 PRINT CHR$(147)
 12090 FOR F=0 TO NF%
 12100 PRINT A$(F,0) TAB(CH%+1)A$(F,RF%)
 12110 NEXT
 12120 RETURN
```

Line 12050 is responsible for finding the matching record. The FOR/NEXT loop scans through the file, attempting to find the record whose keyfield matches the desired keyfield in K$. If a match is found, the record number is assigned to RF% and the flag (F2%) is set to 1. If, on leaving the FOR/NEXT loop, F2% is still at 0, the record does not exist.

If the record is found, the second FOR/NEXT loop displays the record. The fields are displayed, one below the other. The field heading, A$(F,0), and the field data, A$(F,R), are displayed on the same line using TAB(CH%+1). You will remember that you decided the maximum CH% (refer back to the input validation subroutine). The extra 1 is to ensure a space between the field heading and the field data.

Part 9 next month will include a full filing program, containing most of the subroutines described above. Some additional subroutines will appear, including an option for sorting the file into order under any field heading. Also discussed will be the necessary ammendments needed for disc drive operation.

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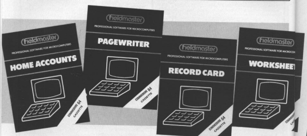
BUSINESS FILE

Fieldmaster offer quite a range of software for the small business. Dave Crisp put their six packages to the test.

THE SIX PIECES OF FIELDMASTER Software to come under my scrutiny were Worksheet, Home Accounts, Pagewriter, Posterprint, Record Card and Mail label. The programs are very long and the tape version take an age to load. The disc versions all take around 70 seconds.


Fieldmaster
PROFESSIONAL SOFTWARE FOR MICROCOMPUTERS
HOME ACCOUNTS
COMMODORE 64
CASSETTE
Fieldmaster
PROFESSIONAL SOFTWARE FOR MICROCOMPUTERS
PAGEWRITER
COMMODORE 64
CASSETTE
Fieldmaster
PROFESSIONAL SOFTWARE FOR MICROCOMPUTERS
RECORD CARD
COMMODORE 64
CASSETTE
Fieldmaster
PROFESSIONAL SOFTWARE FOR MICROCOM
WORKSHEE

Before dealing with specific programs it may be worth pointing out a few things that are applicable to all six. The first thing is that they have all been compiled using the Petspeed Compiler, and this is fairly obvious from the speed at which they operate. Searches (where relevant) are fast, as is response to key-presses, although not quite fast enough on the Pagewriter software.

Consistency seems to be an important consideration with Fieldmaster. Throughout all the programs the method of use is the same, as illustrated by the instruction manual. Whole chunks are the same irrespective of the program. This is not a criticism. It makes changing from one program to the other easy, and is something other software houses could take a look at.

Storage

In the programs where information storage is an integral part, the database for example, there are limitations. The sheer size of the programs prevent large amounts of data being stored in RAM but, with careful use of the disc drive, large amounts of data can be stored and retrieved from the disc. This is what lets the programs down.

The screen presentation is smooth and professional – everything is clear and easy to read with plenty of on screen prompts.

Worksheet

Worksheet is a Spreadsheet program. I cannot even recommend this as a good spreadsheet for beginners due to the scant documentation. But, it does have the ability to produce a bar graph of figures. This may be its saving grace but look carefully before you buy.

Record Card

Record card is a database program of the simplest type. For storing things like names and addresses, record collections and so on it is more than adequate. Like all the other Fieldmaster software it is easy to use and the presentation is superb, but it falls down on versatility.

It is a basic card index program with fairly good search facilities, and a small degreee of calculation. Totals can be obtained from numeric fields but that is its extent. Records appear to be stored by the page, so there seems no advantage to keeping cards small. According to the manual the maximum is 100 records. Of course you can store more than 1 file on a disc but with the loading times of the program and its price it does seem a bit like taking a nut to crack a sledgehammer!

Pagewriter

Pagewriter is a very basic wordprocessor. It is easy to use but has its limitations.

It is advertised as a full function wordprocessor but that is a little optimistic to my mind. The most obvious omission is wordwrap. With this function missing I found I had missed many words and had to do constant editing. The facilities it does have are insert/delete, centre, l/r justify, calculation, reverse print line, double width print and the ability to build up a small file of names and addresses, etc, in order to label print.

Memowriter would be a better title for this package because of its limitations but, if you do need to prepare short documents quickly and simply, this may be a reasonable buy.

Mail Label

Mail label does just what it says. It can be used as a simple card index or, more usefully, as a label printer.

It is limited to 200 labels per file but the biggest restriction is its inability to cope with more than 1 label width at a time. The printout options should certainly be more versatile.

It is a pity there is no integration between this and pagewriter as that would have made it more useable.

Posterprint

Posterprint allows you to design and print posters up to a maximum size of 40★21 cms.

You can use all the Commodore graphic keys to produce your design and print it out, if you have a printer which will support Commodore graphics. This is an expensive colouring book at £21.95.

Home Accounts

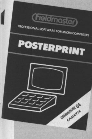
Home accounts was the best offering of the lot although I was still amazed by its lack of capacity. There are only 18 headings for income and 18 for expenditure. Once again, its presentation was good, and it was easy to use. A big plus was the on-screen calculator – a calculator appears while you are doing your maths.

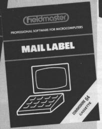
It provides for full banking routines, and a comprehensive range of printouts can be obtained. If you do want to computerise your home accounts then this may suffice. But, with only 18 headings it is only suitable for a very small business

In conclusion

First of all, I think Fieldmaster should reconsider their pricing structure: all, except Home Accounts are overpriced.

Technically, apart from the low capacity, they are excellent. A partnership between Fieldmaster's programmers and Gemini's designers would, I feel, produce some excellent software. Gemini's problem is in the programming itself; everything else is excellent.





Prices

Worksheet	£19.95
Record Card	£19.95
Pagewriter	£29.95
Mail Label	£29.95
Posterprint	£21.95
Home Accounts	£19.95

Jamie Clyde's sophisticated music synthesizer allows you to make full use of the 64's amazing sound facilities with only limited knowledge of the machine.

COMPOSER 64

COMPOSER 64 ALLOWS YOU to concentrate on your tune and to forget about PEEKs and POKEs and other programming headaches normally associated with sound. Your completed masterpieces can be dumped straight on to a printer in the form of numbers, although this can be done by hand if you have a hard copy facility in this system. The figures can be used in your own programs but, if you feel that your BASIC is not good enough, you can simply hear your tune played back to you on Composer 64.

How it works

The program constantly checks the loctions 54272-54296 in the memory and displays the contents on the screen. This means you can see exactly what is happening in the SID chip while you enter your tune.

Composer 64 allows you to use almost all of the 64's sound features. For example, you can build up chords using all three voices, change the shape of a note using the envelope controls and waveform features, and even sychronise or modulate two voices.

Using Composer 64

When the program is run, a title page will appear. When instructed to, press the space bar and begin. Figure 1 shows a breakdown of the screen.

Five boxes display information. The top box represents the keyboard. White notes are displayed in the bottom half and black notes in the top half. In the empty space between the notes, a white asterisk is displayed at the left-hand end and above the 'C'; this is the note marker. For example, to play a 'D', the marker must be moved two positions right so it will be placed directly above the 'D' on the keyboard. To do this, press the cursor left/right key twice, followed by a space which plays and remembers the note. If a 'C' sharp is now needed, the marker must be moved to the correct position by pressing the cursor up/down key once and then the space bar. Note: the space bar must be pressed before continuing with another note.

Recording

When you understand how to play the notes and feel ready to move to the next note on your tune, press RETURN. The note number will be increased by one and is displayed in another box – the tune information box. You can now play more notes. If you press 'P', the tune will be played back. Composer 64 allows you to play a tune consisting of up to 100 notes.

Introducing chords

So far, you would have been using voice one. However, there are two extra voices which can have different note values and be played simultaneously with voice one. To play a C chord, the following procedure should be followed:

1. Press CTRL and 1 simultaneously to start again.
2. Move the marker to 'C' and press space then V - voice 1.
3. Move the marker to 'E' and press space then V – voice 2.
4. Move the marker to 'G' and press space then V – voice 3.

Whenever space is pressed, a 'C' chord should be played. When 'V' is pressed, the voice number which you are using increases by one and is displayed in the note information box. If you want one voice to be silent for a note, move the marker to the extreme right of the keyboard when you are using the correct voice.

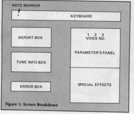


Figure 1: Screen Breakdown

Special features

These are summarised in Figure 2. First of all, to change the type of waveform, ie, the shape of note, press the W key, enter the voice number and pick one of four options:

1. Triangle
2. Sawtooth
3. Pulse
4. Noise

If 3 is selected, you will have to enter high and low pulse values. This is done by entering a number between one and fifteen then a number between 1 and 255, for example 5 then 94. The other functions are fairly self-explanatory and are found in Figure 2.

Extra-special effects can be created by using the special effects panel which comprises an envelope, ring-modulation and synchronise controls. The envelope control determines the length and peak volume of a note and is divided into 4 parts as shown in figure 3. The first half of the note (the Attack and Decay) is altered by pressing 'A' – enter a number between 1 and 255. The second half is altered by pressing 'S' – enter a number between 1 and 255. If a synchronisation of two voices is required, press '*' and enter a number according to figure four. The same applies to ring-modulation except you must press ' ' instead.

Summary

This is how to enter a tune.
1. CTRL + 1
2. Marker to 'C', press space + 'V'.
3. Marker to 'E', press space + 'V'.
4. Marker to 'G', press space + 'V'.
5. Press RETURN.
6. Marker to 'D', press space + 'V'.
7. Marker to 'F #', press space + 'V'.
8. Marker to 'A', press space + 'V'.
9. Press RETURN.
10. Marker to 'E', press space + 'V'.
11. Marker to 'G#', press space + 'V'.
12. Marker to 'B', press space + 'V'.
13. Press RETURN.
14. Press 'P'.

Now, whenever 'P' is pressed, three chords should sound. Try pressing '>' and the tune will increase in key by one semitone. To return to normal, press '<'. Try experimenting with waveforms and synchronisations but, remember, if you want, for example, to change voice 2's waveform to sawtooth throughout the tune, you must return to note 1, alter the waveform and press '[' twice then 'W', '2' and 'Z'.

Key	Function	Extra info. required	Value between
Space	Remember note & play it	None	
Cursor ⇆	Move marker right	None	
Cursor ⇅	Move marker left	None	
Return	Record note & go to next note	None	
W	Change waveform	Voice no., option of wave	1-3, 1-4 [if 3 then 1-15, 1-255]
R	Repeat last note	None	
P	Play back tune	None	
>	Increase key of tune	None	
<	Decrease key of tune	None	
[	Go back to last note	None	
]	Go forward to next note	None	
O	Change octave	Voice no., octave No.	1-3, 0-7
D	Change duration of note	Length of note	1-8
T	Change tempo of tune	Tempo value	1-8
A	Change Attack/Decay	Voice, A/D value	1-255
S	Change Sustain/Release	Voice, S/K value	1-255
*	Change synchronisation	Voice on/off	1-on, 0-off
↑	Change modulation	Voice on/off	1-on, 0-off
V	Change voice	None	
f1	Dump tune to printer	Confirm, home	y/n, name + Return
CTRL + 1	Restart	None	

Figure 2: Keys and their functions

Tunes in programs

The printer output shown in figure 5 can be used in your own programs. An example subroutine is shown in figure 6. To use this in your programs, you simply have to fill in the appropriate data.

If, at first, you have difficulty in understanding the complex functions of Composer 64, please persevere. You will eventually get to grips with it and be able to impress your friends with a very professional sound.

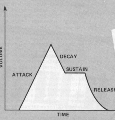
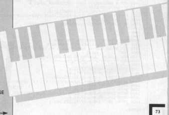
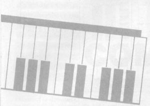


Figure 3: Envelope





ENTER VOICE 1	SYNC/ MODULATE WITH
1	VOICE 1 & VOICE 3
2	VOICE 1 & VOICE 2
3	VOICE 2 & VOICE 3

Figure 4: Synchronisation and modulation

```
                    Nat Anthem
                     Voice 1

No. || Hi  | Low | Wav | PHi | PLo | A&D | S&R | Dur
---++------+-----+-----+-----+-----+-----+-----+-----
1   || 8   | 147 | 16  | 0   | 0   | 12  | 0   | 32
2   || 8   | 147 | 16  | 0   | 0   | 12  | 0   | 64
3   || 9   | 159 | 16  | 0   | 0   | 12  | 0   | 96
4   || 8   | 23  | 16  | 0   | 0   | 12  | 0   | 256
5   || 8   | 147 | 16  | 0   | 0   | 12  | 0   | 32
6   || 9   | 159 | 16  | 0   | 0   | 12  | 0   | 256
7   || 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0
8   || 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0
9   || 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0
10  || 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0

                     Voice 2

No. || Hi  | Low | Wav | PHi | PLo | A&D | S&R | Dur
---++------+-----+-----+-----+-----+-----+-----+-----
1   || 34  | 75  | 16  | 0   | 0   | 12  | 0   | 32
2   || 34  | 75  | 16  | 0   | 0   | 12  | 0   | 64
3   || 38  | 126 | 16  | 0   | 0   | 12  | 0   | 96
4   || 32  | 94  | 16  | 0   | 0   | 12  | 0   | 256
5   || 34  | 75  | 16  | 0   | 0   | 12  | 0   | 32
6   || 38  | 126 | 16  | 0   | 0   | 12  | 0   | 256
7   || 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0
8   || 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0
9   || 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0
10  || 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0

                     Voice 3

No. || Hi  | Low | Wav | PHi | PLo | A&D | S&R | Dur
---++------+-----+-----+-----+-----+-----+-----+-----
1   || 1   | 18  | 16  | 0   | 0   | 12  | 255 | 32
2   || 1   | 0   | 16  | 0   | 0   | 12  | 255 | 64
3   || 1   | 18  | 16  | 0   | 0   | 12  | 255 | 96
4   || 0   | 0   | 16  | 0   | 0   | 12  | 255 | 256
5   || 1   | 18  | 16  | 0   | 0   | 12  | 255 | 32
6   || 0   | 0   | 16  | 0   | 0   | 12  | 255 | 256
7   || 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0
8   || 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0
9   || 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0
10  || 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0
```

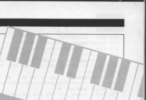
Figure 5: Sample hard copy dump

```
1000 REM * ROUTINE TO PLAY COMPOSER64 TUNES *
1010 S1=54272:POKES1+24,15
1015 POKES1+4,1:POKES1+11,1:POKES1+18,1
1020 POKES1+4,0:POKES1+11,0:POKES1+18,0:FORT=0TO20:READA%:POKES1+T,A%:NEXT
1030 READDUR:FORT1=1TODUR:NEXT
1040 READCHECK:IFCHECK=0THEN1020
1041 :
1042 :
1043 :
1050 REM * DATA STATEMENTS FOR TUNE *
1060 REM FORMAT  3 LINES FOR EACH NOTE
1070 REM AFTER END OF TUNE PLACE 1 AT END OF DATA
1080 REM          PULSE
1100 REM  LOW HI  L H WA AD SR  DUR (1-END OF TUNE)
1200 REM  ---,---,-,-,--,--,---,---,
1500 :
1600 DATA 147,  8,0,0,17,12,0
1610 DATA  75, 34,0,0,17,12,0
1620 DATA  18,  1,0,0,17,12,255,320,
1630 DATA 147,  8,0,0,17,12,0
1640 DATA  75, 34,0,0,17,12,0
1650 DATA   1,  0,0,0,17,12,255,640,
1660 DATA 159,  9,0,0,17,12,0
1670 DATA 126, 38,0,0,17,12,0
1680 DATA  18,  1,0,0,17,12,255,960,1

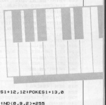
READY.
```

Figure 6: Routine for programs with data for 3 notes of National Anthem
NB. Add one to waveform value × 10 the duration.

Program Listing



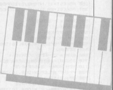
```
0 REM ******************************
1 REM *     C O M P O S E R 6 4    *
2 REM *                            *
3 REM *   WRITTEN BY JAMIE  CLYDE  *
4 REM *                            *
5 REM *     FOR THE COMMODORE64    *
6 REM *                            *
7 REM * COPYRIGHT(C) J.C APRIL ' 84 *
8 REM ******************************
9 :
90 DIMFH(94),FL(94),NO(100,11,2)
100 REM * FEED IN DATA *
109 REM CLR-CTH
110 PRINT"■":POKE53272,22:POKE53280,0:POKE53281,0
119 REM HOM-RVS-RED YEL RED
120 PRINT"■■      ■ ORITTEN BY ┐AMIE ─LYDE ■        "
129 REM CRU-RVS-RED
130 PRINT"□■■                                        "
134 REM CRU-RVS-RED CYN RED
135 PRINT"□■■ ◣                                     ■ "
139 REM CRU-RVS-RED CYN PUR CYN RED CRU-RVS-RED CYN
140 PRINT"□■■ ◣ ■▬                                 ■ ":W$="□■■ ◣ "
149 REM PUR CYN PUR CYN PUR CYN PUR CYN PUR CYN PUR CYN PUR CYN PUR CYN RED
150 PRINTW$"■◣  ■▬◣ ■.▌.◣ ■▬◣ ■▬◣ ■▬ ■▬ ■▬◣ ■ "
~~158 REM PUR CYN PUR CYN PUR CYN PUR CYN PUR CYN PUR CYN PUR CYN PUR CYN PUR-~~
159 REM CYN PUR CYN PUR CYN PUR CYN RED
160 PRINTW$"■◣  ■◣ ■◣ ■▌"▌◣ ■◣ ■◣ ■◣ ■◣ ■◣ ■◣  ■◣  ■◣ ■ "
168 REM PUR CYN PUR CYN PUR CYN PUR CYN PUR CYN PUR CYN PUR CYN PUR CYN PUR-
169 REM-OFF RVS CYN PUR CYN PUR CYN RED
170 PRINTW$"■◣  ■◣ ■◣ ■◣ ■◣ ■▬ ■◣ ■◣ ■"▬ ■▬ ■▬▬ ■ "
179 REM CRU-RVS-RED CYN RED
180 PRINT"□■■ ◣▌  ▌ ▌▌ ▌▌  ▌ ▌  ▌▌ ▌▌■ "
189 REM CRU-RVS-RED CYN RED
190 PRINT"□■■ ◣▌  ▌ ▌▌ ▌▌  ▌ ▌  ▌▌ ▌64■ "
199 REM CRU-RVS-RED CYN RED
200 PRINT"□■■ ◣ ─── ─── ─  ─ ─  ─── ── ─── ─ ─ ■ "
209 REM CRU-RVS-RED CYN RED
210 PRINT"□■■ ◣                                 ■ "
219 REM CRU-RVS-RED
220 FORT=1TO12:PRINT"□■■                   ":NEXT
224 REM   5*CRU-  5*CRR-GRN-RVS
225 PRINT"□□□□□■■■■■■■"
229 REM   5*CRR-GRN-RVS
230 PRINT"■■■■■■■ ┐LEASE WAIT FOR ─ATA LOADING "
234 REM CRU-  5*CRR-GRN-RVS
235 PRINT"□■■■■■■■                              "
240 FORT=0TO94:READFH(T),FL(T):NEXT
250 S1=54272:FORT=1TO24:POKES1+T,0:NEXT
255 POKES1+24,15
260 POKES1+4,17:POKES1+5,12:POKES1+6,0:POKES1+11,17:POKES1+12,12:POKES1+13,0
265 FORB=0TO1:NO(0,8,B)=12:NO(0,9,B)=0:NEXT
270 POKES1+18,17:POKES1+19,12:POKES1+20,255:NO(0,8,2)=12:NO(0,9,2)=255
279 REM  2*CRU-RVS-  6*CRR
280 PRINT"□□■■■■■■■    ┐RESS  ANY ┘EY TO │EGIN  "
290 GETR$:IFR$=""THEN290
299 REM CLR
300 PRINT"■":POKE53280,6:POKE53281,0
304 REM HOM-TXT RVS-ORN
305 PRINT"■■"TAB(13)"■ ─OMPOSER64 "
```

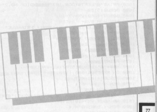


```
309 REM   3*CRR-RED
310 PRINT"████┌──────────────────────────┐"
313 REM   3*CRR RVS-GRN BWN GRN BWN GRN BWN GRN BWN GRN BWN GRN BWN GRN OFF-
314 REM-RED
315 PRINT"████|██    █ #█  █ #█    █ #█  █ #█  █ #█    █_█  ██|"
318 REM   3*CRR RVS-GRN BWN GRN BWN GRN BWN GRN BWN GRN BWN GRN BWN GRN OFF-
319 REM-RED
320 PRINT"████|██    █C █  █D █    █F █  █G █  █A █    █T█  ██|"
329 REM   3*CRR RVS-GRN OFF RVS OFF-RED
330 PRINT"████|██  █                        █  ██|"
338 REM   3*CRR RVS-GRN GR1 GRN GR1 GRN GR1 GRN GR1 GRN GR1 GRN GR1 GRN GR1
339 REM GRN GR1 GRN OFF-RED
340 PRINT"████|██  █C█  █D█  █E█ █F█  █G█  █A█  █B█ █C█   ██|"
349 REM   3*CRR-RED RVS-GRN OFF-RED
350 PRINT"█████|██                            ██|"
359 REM   3*CRR-RED
360 PRINT"████└──────────────────────────┘"
369 REM CRR-RED   4*CRR
370 PRINT"██┌────────────┐████┌────────────┐"
379 REM CRR-RED RVS-YEL OFF-RED   4*CRR RVS-ORN OFF-RED
380 PRINT"██|██           ██|████|██  XDICE  ─ATA   ██|"
388 REM CRR-RED RVS-YEL OFF-RED   4*CRR RVS-ORN PUR-OFF RVS-ORN PUR-OFF RVS-
389 REM-ORN PUR-OFF RVS-ORN OFF-RED
390 PRINT"██|██           ██|████|██  ██1██   ██2██   ██3██  ██|"
399 REM CRR-RED RVS-YEL OFF-RED   4*CRR RVS-ORN OFF-RED
400 PRINT"██|██           ██|████|██   ---   ---   ---  ██|"
409 REM CRR-RED RVS-YEL OFF-RED   4*CRR ORN RVS OFF-RED
410 PRINT"██|██           ██|████|█OV█:TRI   TRI   TRI  ██|"
419 REM CRR-RED   4*CRR ORN RVS OFF-RED
420 PRINT"██└────────────┘████|█H█:00    00    00   ██|"
429 REM CRR-RED   4*CRR ORN RVS OFF-RED
430 PRINT"██┌────────────┐████|█L█:000   000   000  ██|"
439 REM CRR-RED RVS-LBL OFF-RED   4*CRR ORN RVS OFF-RED
440 PRINT"██|██ /OTE  NO. 1 ██|████|█C█: 5     5     5   ██|"
449 REM CRR-RED RVS-LBL OFF-RED   4*CRR GR2 RVS OFF-RED
450 PRINT"██|██ XDICE NO. 1 ██|████|█/T█:0     0     0   ██|"
459 REM CRR-RED RVS-LBL OFF-RED   4*CRR CYN RVS OFF-RED
460 PRINT"██|██ ─URATION  0 ██|████|◣♦─█:12    12    12  ██|"
469 REM CRR-RED RVS-LBL OFF-RED   4*CRR CYN RVS OFF-RED
470 PRINT"██|██ |EMPO     5 ██|████|◣♥_█:00    00    255 ██|"
479 REM CRR-RED   4*CRR CYN RVS OFF-RED
480 PRINT"██└────────────┘████|◣♥C█:NO    NO    NO   ██|"
489 REM CRR-RED CYN RVS RED-OFF
490 PRINT"██┌────────────┐    |◣_M█:NO    NO    NO   ██|"
499 REM CRR-RED RVS-PUR OFF-RED
500 PRINT"██|██           ██|    └────────────────┘"
509 REM CRR-RED
510 PRINT"██└────────────┘"
519 REM  40*CRD
520 DO$="████████████████████████████████████████"
530 NO=1:TE=5:FORT=0TO2:NO(0,3,T)=16:OC(T)=5
540 NO(NO,7,T)=5:NEXT:NO=0
550 POKES1+4,16:POKES1+4,17:POKES1+13,16:POKES1+13,17:POKES1+18,16:POKES1+18,17
599 :
600 REM * NEW  NOTE *
610 GOSUB14100
614 REM HOM-  4*CRD
615 PRINT"█████"TAB(6+X*2)" "
617 IFNO(NO+1,0,1)=0THENNO(NO+1,0,1)=5
```

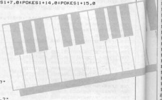
Program Listing (cont.)

```
620 V=0:N0=N0+1:NO=NO+1:IFNO=101THENNO=100:GOTO700
625 FORT=0TO2:IFFL=0THENNO(NO,3,T)=NO(NO-1,3,T):NO(NO,7,T)=0
625 REM HOM-RVS
626 IFOC(T)=0THENOC(T)=5:PRINT"■■"LEFT$(DO$,15)TAB(24+T*5)OC(T)
627 FORT1=0TO3:NO(NO,8+T1,T)=NO(NO-1,8+T1,T):NEXTT1,T
629 REM HOM RVS-LBL
630 PRINT"■"LEFT$(DO$,15)TAB(12)"■■"NO
631 REM RVS
632 PRINTTAB(12)"■"V+1
633 REM RVS
634 PRINTTAB(12)"■"NO(NO,0,1)
639 REM HOM
640 IFFL=0THENFORT=0TO2:PRINT"■"LEFT$(DO$,16)TAB(24+T*5)"000":NEXT
649 REM HOM
650 PRINT"■"LEFT$(DO$,4)TAB(6)"*":X=0:FL=0
700 REM * MAIN R-▜INE *
710 GETR$:IFR$=""THEN710
719 REM CRR
720 IFR$="■"THENGOSUB1000 :GOTO700
729 REM CRD
730 IFR$="■"THENGOSUB1100 :GOTO700
740 IFR$=" "THENGOSUB1200 :GOTO700
750 IFR$="V"THENGOSUB1500 :GOTO700
760 IFR$="A"THENGOSUB2800 :GOTO700
765 IFR$="S"THENGOSUB2900 :GOTO700
770 IFR$="O"THENGOSUB1700 :GOTO700
780 IFR$="W"THENGOSUB1800 :GOTO700
785 IFR$="R"THENGOSUB3000 :GOTO700
790 IFR$="P"THENGOSUB2000 :GOTO700
800 IFR$="D"THENGOSUB2100 :GOTO700
810 IFR$=":"THENGOSUB2300 :IFGH%=0GOTO600
820 IFR$=";"THENGOSUB2200 :IFGH%=0THEN600
830 IFR$="T"THENGOSUB2500 :GOTO700
840 IFR$="."THENGOSUB2600 :GOTO700
850 IFR$=","THENGOSUB2700 :GOTO700
854 REM BLK
855 IFR$="■"THENRUN
860 IFR$="*"THENGOSUB3100 :GOTO700
865 IFR$="↑"THENGOSUB3200 :GOTO700
869 REM F1
870 IFR$="■"THENGOSUB4000 :GOTO700
880 IFR$=CHR$(13)THEN600
900 GOTO700
1000 REM * NOTE RIGHT *
1010 IFX=13THENRETURN
1019 REM HOM-  4*CRD
1020 X=X+1:PRINT"■■■■■■"TAB(X*2+4)"   *"
1030 :
1040 RETURN
1100 REM * NOTE LEFT  *
1110 IFX=0THENRETURN
1119 REM HOM-  4*CRD
1120 X=X-1:PRINT"■■■■■■"TAB(X*2+6)"*   "
1140 RETURN
1200 REM * -ORD NOTE *
1210 N%=X+OC(V)*12:IFX=13THENN%=0
1215 IFN%>94THENN%=94
1220 NO(NO,7,V)=N%:NO(NO,1,V)=FH(N%):NO(NO,2,V)=FL(N%)
1240 GOSUB1300:RETURN
1300 REM * -! NOTE *
```

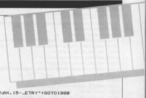




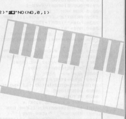
```
1302 FORT4=0TO2:N$=STR$(NO(NO,7,T4)):N$=RIGHT$(N$,LEN(N$)-1)
1303 IFLEN(N$)<3THENN$="0"+N$:GOTO1303
1303 REM HOM
1304 PRINT"■"LEFT$(DO$,16)TAB(24+T4*5)N$:NEXT
1305 POKES1+4,NO(NO,3,0)OR1
1306 POKES1+11,NO(NO,3,1)OR1
1307 POKES1+18,NO(NO,3,2)OR1
1310 POKES1,NO(NO,2,0):POKES1+1,NO(NO,1,0)
1320 POKES1+7,NO(NO,2,1):POKES1+8,NO(NO,1,1)
1330 POKES1+14,NO(NO,2,2):POKES1+15,NO(NO,1,2)
1340 FORT=1TONO(NO,0,1)*(32*TE):NEXT
1350 POKES1+1,0:POKES1,0:POKES1+8,0:POKES1+7,0:POKES1+14,0:POKES1+15,0
1355 POKES1+4,NO(NO,3,0)AND254
1356 POKES1+11,NO(NO,3,1)AND254
1357 POKES1+20,NO(NO,3,2)AND254
1370 RETURN
1500 REM * - VOICE *
1510 V=V+1
1520 IFV=3THENV=0
1529 REM HOM RVS-LBL
1530 PRINT"■"LEFT$(DO$,16)TAB(12)"■■"V+1
1540 RETURN
1700 REM * CHANGE OCTAVE *
1710 GOSUB14000:REM CLEAR BOX
1719 REM HOM   3*CRR-RVS
1720 PRINT"■"LEFT$(DO$,10)"■■■■OICE NO.?"
1730 GOSUB15100
1739 REM HOM   3*CRR-RVS
1740 PRINT"■"LEFT$(DO$,10)"■■■■CTAVE NO.?"
1750 MA$="7":GOSUB15000:OC=VAL(R$)
1754 REM HOM RVS
1755 V%=V%-1:PRINT"■"LEFT$(DO$,15)TAB(24+V%*5)"■"OC
1760 OC(V%)=OC:GOSUB14100:RETURN
1800 REM * CHANGE -&FORM *
1810 GOSUB14000
1819 REM HOM   3*CRR-RVS
1820 PRINT"■"LEFT$(DO$,10)"■■■■OICE NO.?"
1830 GOSUB15100
1840 GOSUB14000:V%=V%-1
1849 REM HOM RVS-  2*CRR
1850 PRINT"■"LEFT$(DO$,9)"■■■1) |RIANGLE"
1859 REM RVS-  2*CRR
1860 PRINT"■■■2) ♥AWTOOTH"
1869 REM RVS-  2*CRR
1870 PRINT"■■■3) ┐ULSE"
1874 REM RVS-  2*CRR
1875 PRINT"■■■4) /OISE"
1880 MA$="4":GOSUB15202:R%=VAL(R$)
1890 ON R%GOSUB1900,1920,1960,1940
1895 GOSUB14100:RETURN
1900 REM * TRI-\E *
1904 REM HOM RVS
1905 PRINT"■"LEFT$(DO$,12)TAB(24+V%*5)"■TRI"
1910 NO(NO,3,V%)=16:RETURN
1920 REM * SAWTOOTH *
1924 REM HOM RVS
1925 PRINT"■"LEFT$(DO$,12)TAB(24+V%*5)"■SAW"
1930 NO(NO,3,V%)=32:RETURN
1940 REM * NOISE *
```



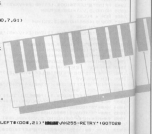
Program Listing (cont.)



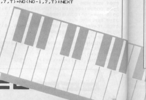
```
1944 REM HOM RVS
1945 PRINT"■"LEFT$(DO$,12)TAB(24+V%*5)"■NOI"
1950 NO(NO,3,V%)=128:RETURN
1960 REM * PULSE *
1965 GOSUB14000:NO(NO,3,V%)=64
1969 REM HOM RVS
1970 PRINT"■"LEFT$(DO$,12)TAB(24+V%*5)"■PUL"
1974 REM HOM   3*CRR
1975 PRINT"■"LEFT$(DO$,10)"███|| ┐ULSE?"
1980 MA$="9":GOSUB15000:N1$=R$
1985 MA$="9":GOSUB15000:N2$=R$
1987 A$=N1$+N2$:NO(NO,4,V%)=VAL(A$)
1987 REM HOM   2*CRR-RVS-PUR
1988 IFA$>"15"THENPRINT"■"LEFT$(DO$,21)"████\AX.15-_ETRY":GOTO1980
1988 REM HOM RVS
1989 PRINT"■"LEFT$(DO$,13)TAB(24+V%*5)"■"A$
1989 REM HOM   3*CRR
1990 PRINT"■"LEFT$(DO$,11)"███_OW ┐ULSE?"
1992 MA$="9":GOSUB15000:R%=VAL(R$):N1$=R$
1994 MA$="9":GOSUB15000:N2$=R$
1995 MA$="9":GOSUB15000:N3$=R$
1996 B$=N1$+N2$+N3$:NO(NO,5,V%)=VAL(B$)
1996 REM HOM   2*CRR-RVS-PUR
1997 IFVAL(B$)>255THENPRINT"■"LEFT$(DO$,21)"████\AX255-_ETRY":GOTO1992
1997 REM HOM RVS
1998 PRINT"■"LEFT$(DO$,14)TAB(24+V%*5)"■"B$
1999 GOSUB14200:RETURN
2000 REM * ─┤ TUNE *
2010 N9=NO:FORNO=1TON0:GOSUB1300:NEXT:NO=N9:RETURN
2100 REM * DURATION *
2104 REM HOM   3*CRR
2105 GOSUB14000:PRINT"■"LEFT$(DO$,10)"███┤URATION?"
2110 MA$="8":GOSUB15000
2119 REM HOM RVS-LBL
2120 NO(NO,0,1)=VAL(R$):PRINT"■"LEFT$(DO$,17)TAB(12)"██"NO(NO,0,1)
2130 GOSUB14100:RETURN
2200 REM * UP NOTE *
2210 GH%=0:IFNO=100ORNO=N0THENGH%=1:RETURN
2215 N0=N0-1
2220 NO=NO+1:GOSUB14300:NO=NO-1:FL=1:RETURN
2300 REM * DOWN NOTE *
2310 GH%=0:IFNO=1THENGH%=1:RETURN
2320 NO=NO-1:N0=N0-1
2330 GOSUB14300:REM UP DATE
2340 NO=NO-1:FL=1
2350 RETURN
2500 REM * CHANGE TEMPO *
2504 REM HOM   5*CRR
2505 GOSUB14000:PRINT"■"LEFT$(DO$,10)"█████ EMPO?"
2510 MA$="8":GOSUB15000
2519 REM HOM RVS-LBL
2520 TE=VAL(R$):PRINT"■"LEFT$(DO$,18)TAB(12)"██"TE
2530 GOSUB14100:RETURN
2600 REM * UP ─┤ *
2610 NO%=NO:FORNO=1TON0:FORG1=0TO2:K%=NO(NO,7,G1)
2615 IFK%=0ORK%=94THEN2630
2617 NO(NO,7,G1)=K%+1
2620 NO(NO,1,G1)=FH(K%+1)
```



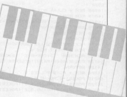
Program Listing (cont.)

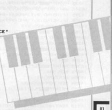


```
2625 NO(NO,2,G1)=FL(K%+1)
2630 NEXT:GOSUB14500:GOSUB1300:NEXT:NO=NO%
2640 RETURN
2700 REM * DOWN ¬ *
2710 NO%=NO:FORNO=1TON0:FORG1=0TO2:K%=NO(NO,7,G1)
2715 IFK%=0ORK%=94THEN2730
2717 NO(NO,7,G1)=K%-1
2720 NO(NO,1,G1)=FH(K%-1)
2725 NO(NO,2,G1)=FL(K%-1)
2730 NEXT:GOSUB14500:GOSUB1300:NEXT:NO=NO%
2740 RETURN
2800 REM * AD CHANGE *
2801 GOSUB14000:REM CLEAR BOX
2801 REM HOM   3*CRR-RVS
2802 PRINT"■"LEFT$(DO$,10)"███XOICE NO.?"
2803 GOSUB15100
2810 GOSUB14000:V%=V%-1
2819 REM HOM   2*CRR
2820 PRINT"■"LEFT$(DO$,11)"██♠TTACK/DECAY?"
2830 AD$="":FORT=1TO3
2840 MA$="9":GOSUB15000
2849 REM HOM   2*CRR-RVS-PUR
2850 AD$=AD$+R$:IFVAL(AD$)>255THENPRINT"■"LEFT$(DO$,21)"███▌AX255-RETRY":GOTO28
30
2859 REM HOM RVS-CYN GR2
2860 NEXT:NO(NO,8,V%)=VAL(AD$):PRINT"■"LEFT$(DO$,17)TAB(24+V%*5)"▲"AD$"▲"
2865 POKES1+5+V%*7,VAL(AD$)
2870 GOSUB14100:RETURN
2900 REM * SR CHANGE *
2901 GOSUB14000:REM CLEAR BOX
2901 REM HOM   3*CRR-RVS
2902 PRINT"■"LEFT$(DO$,10)"███XOICE NO.?"
2903 GOSUB15100
2910 GOSUB14000:V%=V%-1
2919 REM HOM   2*CRR
2920 PRINT"■"LEFT$(DO$,11)"██♥USTAIN/_EL ?"
2930 AD$="":FORT=1TO3
2940 MA$="9":GOSUB15000
2949 REM HOM   2*CRR-RVS-PUR
2950 AD$=AD$+R$:IFVAL(AD$)>255THENPRINT"■"LEFT$(DO$,21)"███▌AX255-RETRY":GOTO29
30
2959 REM HOM RVS-CYN GR2
2960 NEXT:NO(NO,9,V%)=VAL(AD$):PRINT"■"LEFT$(DO$,18)TAB(24+V%*5)"▲"AD$"▲"
2965 POKES1+6+V%*7,VAL(AD$)
2970 GOSUB14100:RETURN
3000 REM * — NOTE *
3005 IFNO=1THENRETURN
3010 FORT=0TO2:NO(NO,1,T)=NO(NO-1,1,T):NO(NO,7,T)=NO(NO-1,7,T):NEXT
3020 GOSUB1300
3030 RETURN
3100 REM * CHANGE SYNC *
3101 GOSUB14000:REM CLEAR BOX
3101 REM HOM   3*CRR-RVS
3102 PRINT"■"LEFT$(DO$,10)"███XOICE NO.?"
3103 GOSUB15100
3110 GOSUB14000:V%=V%-1
3119 REM HOM   2*CRR
3120 PRINT"■"LEFT$(DO$,10)"██♥YNC  ┌N/┌FF?"
3124 REM HOM   3*CRR
```



Program Listing (cont.)





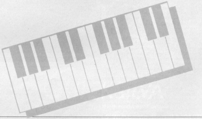
```
3125 PRINT"■"LEFT$(DO$,12)"■■■PRESS 0OR1"
3130 MA$="1":GOSUB15000
3135 IFR$="0"THEN3160
3137 NO(NO,3,V%)=NO(NO,3,V%)OR2
3139 REM HOM RVS-CYN
3140 PRINT"■"LEFT$(DO$,19)TAB(V%*5+24)"◢YES"
3150 GOSUB14100 :RETURN
3160 NO(NO,3,V%)=NO(NO,3,V%)AND253
3169 REM HOM RVS-CYN
3170 PRINT"■"LEFT$(DO$,19)TAB(V%*5+24)"◢NO "
3180 GOSUB14100 :RETURN
3200 REM * CHANGE RING *
3201 GOSUB14000:REM CLEAR BOX
3201 REM HOM   3*CRR-RVS
3202 PRINT"■"LEFT$(DO$,10)"■■■XOICE NO.?"
3203 GOSUB15100
3210 GOSUB14000:V%=V%-1
3219 REM HOM   2*CRR
3220 PRINT"■"LEFT$(DO$,10)"■■G \. ΓN/ΓFF?"
3224 REM HOM   3*CRR
3225 PRINT"■"LEFT$(DO$,12)"■■■PRESS 0OR1"
3230 MA$="1":GOSUB15000
3235 IFR$="0"THEN3260
3237 NO(NO,3,V%)=NO(NO,3,V%)OR4
3239 REM HOM RVS-CYN
3240 PRINT"■"LEFT$(DO$,20)TAB(V%*5+24)"◢YES"
3250 GOSUB14100 :RETURN
3260 NO(NO,3,V%)=NO(NO,3,V%)AND251
3269 REM HOM RVS-CYN
3270 PRINT"■"LEFT$(DO$,20)TAB(V%*5+24)"◢NO ".
3280 GOSUB14100 :RETURN
3990 STOP
3992 :
3993 :
3994 REM   *********************
3995 REM   * SPECIAL R-◥INES *
3996 REM   *********************
3997 :
3998 :
4000 REM * PRINT TUNE *
4009 REM HOM
4010 GOSUB14000:PRINT"■"LEFT$(DO$,10)TAB(3)"¬RESS ♥PACE"
4020 PRINTTAB(2)" '←'  -¬SCAPE"
4025 GETR$:IFR$<>" "ANDR$<>"←"THEN4025
4027 IF R$="←"THENGOSUB14100:RETURN
4029 REM YEL-RVS GR2
4030 PRINTTAB(5)"■■ /AME ?■":G$=""
4032 GETR$:IFR$=""THEN4032
4034 G$=G$+R$:IFR$<>CHR$(13)THEN4032
4036 G$=LEFT$(G$,LEN(G$)-1)
4040 OPEN1,4,7:PRINT#1,CHR$(14)SPC(15)G$
4045 FORT=0TO2
4049 REM CTJ-TXT-CTP
4050 PRINT#1,"
                                XOICE "T+1
4060 PRINT#1,CHR$(15)CHR$(10)"     /D.|| ||  | LOW | OAV | ¬|| |"'
4065 PRINT#1," ¬LD | ♠&- | ♥&_ | -UR"
4070 PRINT#1,"      ——++——+——+——+——+——+——+——+——"
4079 REM CTO-CTP CTP CTP
```

Program Listing (cont.)

```
4080 FORT1=1TON0:PRINT#1,"██06"T1"█10||"NO(T1,1,T)"█17|"NO(T1,2,T);
4089 REM CTO-CTP CTP CTP
4090 PRINT#1,"██23|"NO(T1,3,T)"█29|"NO(T1,4,T)"█35|"NO(T1,5,T);
4099 REM CTO-CTP CTP CTP
4100 PRINT#1,"██41|"NO(T1,8,T)"█47|"NO(T1,9,T)"█53|"NO(T1,0,1)*(32*TE)
4110 NEXTT1,T:CLOSE1:GOSUB14100
4120 RETURN
9990 STOP
9991 :
9992 :
14000 REM * CLEAR BOX *
14009 REM HOM
14010 PRINT"█"LEFT$(DO$,8):FORT=1TO4
14019 REM    2*CRR-RVS-YEL
14020 PRINT"███                "
14029 REM GR2
14030 NEXT:PRINT"█":RETURN
14100 REM * INPUT BOX *
14109 REM HOM    3*CRR-RVS    2*CRD-   6*CRL
14110 GOSUB14000:PRINT"█"LEFT$(DO$,10)"████NPUT \ODE█████████D.K"
14120 RETURN
14200 REM * POKE PULSES *
14210 POKES1+2,NO(NO,5,0):POKES1+3,NO(NO,4,0)
14220 POKES1+11,NO(NO,5,1):POKES1+12,NO(NO,4,1)
14230 POKES1+18,NO(NO,5,2):POKES1+19,NO(NO,4,2)
14240 RETURN
14300 REM * UP DATE *
14310 FORT=0TO2:FORT1=1TO2:X$=STR$(NO(NO,T1+3,T)):X$=RIGHT$(X$,LEN(X$)-1)
14312 IFLEN(X$)<T1+1THENX$="0"+X$:GOTO14312
14314 REM HOM-RVS-GR2
14315 PRINT"███"LEFT$(DO$,12+T1)TAB(24+T*5)X$:NEXT
14320 IFNO(NO,7,T)<>0THENOC(T)=INT(NO(NO,7,T)/12)
14324 REM RVS
14325 PRINTTAB(24+T*5)"█"OC(T)
14330 FORT1=0TO1:AS$=STR$(NO(NO,8+T1,T))
14334 REM HOM-RVS-YEL
14335 PRINT"███"LEFT$(DO$,17+T1)TAB(24+T*5)RIGHT$(AS$,LEN(AS$)-1):NEXT
14340 W$="TRI":IF(NO(NO,3,T)AND32)=32THENW$="SAW"
14345 IF(NO(NO,3,T)AND64)=64THENW$="PUL"
14350 IF(NO(NO,3,T)AND128)=128THENW$="NOI"
14354 REM HOM-RVS-GR2
14355 PRINT"███"LEFT$(DO$,12)TAB(24+T*5)W$
14357 W$="NO ":IF(NO(NO,3,T)AND2)=2THENW$="YES"
14359 REM HOM-RVS-YEL
14360 PRINT"███"LEFT$(DO$,19)TAB(24+T*5)W$
14363 W$="NO ":IF(NO(NO,3,T)AND4)=4THENW$="YES"
14364 REM HOM-RVS-YEL
14365 PRINT"███"LEFT$(DO$,20)TAB(24+T*5)W$
14379 REM GR2
14380 NEXT:PRINT"█"
14384 REM HOM-RVS-GR2
14385 PRINT"███"LEFT$(DO$,17)TAB(12)NO(NO,0,0):GOSUB14500
14390 RETURN
14500 REM * PRINT NOTE *
14510 FORT=0TO2:N$=STR$(NO(NO,7,T)):N$=RIGHT$(N$,LEN(N$)-1)
14520 IFLEN(N$)<3THENN$="0"+N$:GOTO14520
14529 REM HOM
14530 PRINT"█"LEFT$(DO$,16)TAB(24+T*5)N$
```

Program Listing (cont.)

```
14540 NEXT:RETURN
15000 REM * ERROR *
15002 POKE198,0:WAIT198,1:GETR$:IFR$<"0"ORR$>MA$THEN15010
15004 REM HOM   2*CRR-RVS-PUR ORN
15005 PRINT"■"LEFT$(DO$,21)"■■■■                    ■"
15007 RETURN
15009 REM HOM   2*CRR-RVS-PUR YEL
15010 PRINT"■"LEFT$(DO$,21)"■■■■ YPE0 - "MA$"ONLY■"
15020 GOTO15002
15100 POKE198,0:WAIT198,1:GETR$:IFR$<"1"ORR$>"3"THEN15110
15104 REM HOM   2*CRR-RVS-PUR ORN
15105 PRINT"■"LEFT$(DO$,21)"■■■■                    ■"
15107 V%=VAL(R$):RETURN
15109 REM HOM   2*CRR-RVS-PUR
15110 PRINT"■"LEFT$(DO$,21)"■■■■ YPE1,2,3ONLY"
15120 GOTO15100
15202 POKE198,0:WAIT198,1:GETR$:IFR$<"1"ORR$>MA$THEN15210
15204 REM HOM   2*CRR-RVS-PUR ORN
15205 PRINT"■"LEFT$(DO$,21)"■■■■                    ■"
15207 RETURN
15209 REM HOM   2*CRR-RVS-PUR ORN
15210 PRINT"■"LEFT$(DO$,21)"■■■■ YPE1 - "MA$"ONLY■"
15220 GOTO15202
49990 STOP
49997 REM ********
49998 REM * DATA *
49999 REM ********
50000 DATA1,18,1,35,1,52,1,70,1,90,1,110,1,132,1,155,1,179,1,205,1,233
50010 DATA2,6,2,37,2,69,2,104,2,140,2,179,2,220
50015 DATA3,8,3,54,3,103,3,155,3,210,4,12,4,73
50020 DATA4,139,4,208,5,25,5,103,5,185
50025 DATA6,16,6,108,6,206,7,53,7,163,8,23,8,147,9,21
50030 DATA9,159,10,60,10,205,11,114,12,32,12,216,13,156,14,107,15,70,16,47
50040 DATA17,37,18,42,19,63,20,100,21,154,22,227,24,63,25,177,27,56,28,214
50050 DATA30,141,32,94,34,75,36,85,38,126,40,200,43,52,45,198,48,127,51,87
50060 DATA54,111,57,172,61,126,64,188,68,149,72,169,76,252,81,161,86,105,91,140
50070 DATA96,254,102,194,108,223,115,88,122,52,129,120,137,43,145,83,153,247
50080 DATA163,31,172,210,183,25,193,252,205,133,217,189,230,176,244,103
READY.
```



RELIABLE ROUTINES

Month by month, Mike Hart will present you with useful subroutines from which you can build an invaluable programming reference library.

WHEN YOU HAVE STARTED to master your Commodore machine, two of the most frequently asked questions are these: 'How do I get a message printed out on the screen exactly where I want it?' and 'How do I present a column of figures?'

In more sophisticated BASICs, these two problems are usually taken care of by a couple of keywords or rather key phrases, namely PRINT@ and PRINT USING, respectively. However, the BASIC present in the VIC and the Commodore 64 is too restricted to cater for these possibilities and, consequently, we will need to have recourse to subroutines which simulate both of these procedures.

PRINT @

Here I shall show you three methods of which the first is in BASIC, the third in machine-code and the second some way in-between!

Method 1: Listing No. 1
Here the strings H$ and V$ are defined as the requisite number of cursor rights and cursor downs appropriate to your machine (eg, for a Commodore 64, 40 cursor rights and 25 cursor downs). In the subroutine, the cursor is 'HOMEd' and an appropriate number of cursor rights and downs printed before printing the null character followed by a semi-colon.

After the return from the subroutine, the string is printed at the appropriate position on the screen. In each case, counting starts from zero rather than from 1 as is conventional.

Method 2: Listing 2
This is almost exactly the same technique as the previous one but we rely upon a ROM technique to position the cursor for us. Notice that the vertical co-ordinate is fed into location 781, the horizontal into location 782, 0 into location 783, before the SYS call is made into ROM. This works equally well on the VIC-20 or the Commodore 64.

Method 3: Listing 3
This short machine code routine can be POKEd into a convenient part of memory (eg, at 300 decimal or 700 decimal will do). Then to call the routine, use the following:

SYS (Location) H,V; "******"

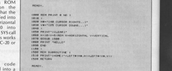
where H is the horizontal vector and the V is the vertical vector. Notice that there is no comma after the bracket but there is a semicolon delimiter after the V, immediately before you print out your string.

PRINT USING

This routine will correctly round your columns of figures to the required number of decimal places and will also line up the figures with the decimal point in the right position. This is not a full-scale PRINT USING but will serve for most of your purposes. It makes use of user-defined functions, the first being to round your number and the second being to work out the correct number of spaces before the decimal point for both positive and negative numbers.

Listing 4 shows you how the user-defined functions are set up. Note that in line 4020, RN refers to rounding number and will be 10 for one place of decimals, 100 for two and so on. In line 4040, you may alter the padding 'value' of spaces which is set initially to 10.

Program Listing 1

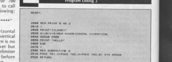


```
READY.

1000 REM PRINT @ NO 1
1010 :
1020 H$="[40 CURSOR RIGHTS..]"
1030 V$="[25 CURSOR DOWNS...]"
1040 :
1050 PRINT"[CLEAR]"
1060 H=10:V=5:REM H=HORIZONTAL V=VERTICAL
1070 GOSUB 1500
1080 PRINT "HELLO"
1090 END
1100 :
1500 REM SUBROUTINE 1
1510 PRINT"[HOME]";LEFT$(H$,H);LEFT$(V$,V);
1520 RETURN

READY.
```

Program Listing 2

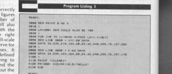


```
READY.


2000 REM PRINT @ NO 2
2010 :
2020 PRINT"[CLEAR]"
2030 H=10:V=5:REM H=HORIZONTAL V=VERTICAL
2040 GOSUB 2500
2050 PRINT "HELLO"
2060 END
2070 :
2500 REM SUBROUTINE 2
2510 POKE 781,V:POKE 782,H:POKE 783,0: SYS 65520
2520 RETURN

READY.
```

Program Listing 3

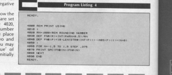


```
READY.

3000 REM PRINT @ NO 3
3010 :
3020 LN=300: REM COULD ALSO BE 700
3030 :
3040 FOR J=0 TO 11:READ X:POKE LN+J,X:NEXT
3050 REM LINE 3060 = VIC-20 DATA
3060 DATA 32,235,215,164,20,24,32,240,255,76,157,202
3070 :
3080 REM LINE 3090 = C-64 DATA
3090 DATA 32,235,183,164,20,24,32,240,255,76,157,170
3100 :
3110 PRINT "[CLEAR]"
3120 PR=300: SYS(PR)10,5;"HELLO"
3130 END

READY.
```

Program Listing 4



```
READY.


4000 REM PRINT USING
4010 :
4020 RN=1000:REM ROUNDING NUMBER
4030 DEF FNA(R)=INT(R*RN+0.5)/RN
4040 DEF FNB(P)=10-LEN(STR$(INT(P)))-(ABS(P)<1)+(N<0)
4050 :
4060 FOR N=-1.5 TO 1.5 STEP .375
4070 PRINT SPC(FNB(N))FNA(N)
4080 NEXT
4090 END
READY.
```

In the last part of this series, Allen Webb discusses how to add that extra special touch to your adventure with graphics of humour, for example.

SETTING OUT ON AN ADVENTURE

UP TO NOW, I HAVE DISCUSSED THE use of text only. For some inexplicable reason, graphics are being used more and more. But, whilst they can be used to portray a pretty scene, the careful use of text can be equally effective. If you must use graphics, the first problem is to choose the system most suited to your needs/programming ability. It must be appreciated that graphics are RAM hungry and you will have to make a compromise between program complexity and picture quality.

Picture production

On the 64 there are many ways of producing pictures, each presenting it's own difficulties:

i) Bit mapping can either be used in multicolour or high resolution mode. To use this method effectively you would need to write a set of graphic routines, preferably in machine code, and devise a compression system of the storage of picture data. To display text with the picture you would need to use raster interrupts or some other method.

ii) With the advent of packages such as the Koala pad, it is possible to draw high quality pictures in multicolour mode. Such pictures can be loaded one by one, when required, from disc. Due to it's sequential nature, the cassette recorder is not suitable for this approach.

iii) The 64 allows great flexibility with the creation of redefined characters. Using one or more character sets on screen (by virtue of raster interrupts), complex pictures (with animation) can be readily created.

iv) Finally, sprites can be used to generate pictures.

For most users, options iii) and iv) are probably most feasible.

You may have noted that I constantly refer to the use of raster interrupts. This powerful facility allows the mixing of several graphics modes on screen simultaneously. (See our November issue for further information in raster interrupts).

Adding complexity

One way of adding depth to the game is to introduce other characters. These can either be active, so you can interact with them, or passive. It is a fairly simple matter to introduce a simple form of artificial intelligence which will give the feeling of complexity.

Consider the trivial example in Listing 1. This shows the reactions of a figure met in an inn. The variable SP is a suspicion factor; the lower it's value, the more suspiciously the man behaves. The value of SP can be altered during the game by your actions.

The secret of effective routines of these types is to offer variety without excessive repetition. The element of surprise is an additional element which can enhance the game. How about being captured by various foes without warning and being put in some nasty situation from which you must escape? Please don't use instant death, however. Games which give messages such as "You fell down a hole and are dead" simply show a lack of imagination.

Game for a laugh

Why not write a game in which you can't get killed? Humour is closely related to artificial intelligence. The occasional humourous touch can vastly improve a game. In essence there are three types of humour:

i) The 'one off' joke
ii) The continuing joke
iii) The unexpected joke

```
10 ON SP GOTO 20,30,40,50,60
20 PRINT"HE TREATS YOU WITH CONTEMPT AND PUTS A KNIFE TO YOUR THROAT":
   RETURN
30 PRINT"HE MUTTERS SOMETHING ABOUT OUTLANDERS AND CONTINUES TO DRINK
   HIS ALE":RETURN
40 PRINT"HE DECLINES TO EAT WITH A STRANGER BUT SEEMS PREPARED TO
   TALK":RETURN
50 PRINT"HE TREATS YOU IN A GUARDED MANNER BUT PROFERS SOME FOOD":
   RETURN
60 PRINT"HE GREETS YOU WARMLY AS A LONG LOST BROTHER":RETURN
```

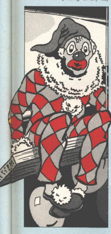
Similar concepts can be applied to bravery, aggression, anger etc. Listing 2 gives a second example. This time you find a group of men in the inn. The routine gives the effect of listening to their conversation.

```
10 ON RND(1)*5+1 GOTO 20,30,40,50,60
20 PRINT"THEY ARE DISCUSSING THE FORTH-COMING HANGING":RETURN
30 PRINT"A MAN DRESSED IN LEATHER IS TELLING A RIBALD TALE":RETURN
40 PRINT"THE MEN ORDER MORE ALE AND START TO SING":RETURN
50 PRINT"THEY SPEAK QUIETLY OF THE FORBIDDEN LANDS TO THE NORTH":
   RETURN
60 PRINT"THEY NOTICE YOU LISTENING AND ATTACK WITHOUT WARNING":RETURN
```

Humour can be a two edged sword. On the one hand, it can brighten up a game and provide real entertainment. If misused, however, it can become tedious and very irritating.

Avoid one off jokes, they soon become tedious especially if over used and frequently repeated. A continuing joke involves the development of a theme by use of a series of related incidents. You could, for example, encounter a whippet which becomes progressively more aggresive and does progressively nastier things to you each time you meet it. Continuing jokes are fun, but difficult to write well.

The unexpected joke, by virtue of it's shock value, can be very effective. Let me give an example. In one of my games, there is a red button in one location. Pressing the button gives a simulation of the 64 resetting and the usual sign on display complete with flashing cursor is given. The usual reaction is one of disgust at the machine crashing, but the routine is written so that pressing of any key restores the display with a suitable comment. This ploy works well only once, but the effect is excellent and fully justifies it's use.



Data compression

If you've read the first two parts of this series, you will have realised the importance of data storage. Even using the techniques discussed earlier, data storage is still RAM hungry. In order to save space, it may be necessary to use data compression. Such techniques usually store the data in an amended form to save space and are most applicable to text. Level 9, for example, uses data compression extensively to create very complex games.

There are a variety of methods of compressing data. The most effective involve splitting words into frequently used groups of letters and then storing the words as codes. With such methods, reductions in data of 40% to 50% are possible. Listing 3 gives a program which will compress data to give a 33% reduction in size. This method involves the crunching of 3 letters (usually occupying 3 bytes) into 2 bytes.

First assume that we have only 31 letters, namely the alphabet, @, and the common punctuation marks. If you're prepared to use only upper case in your adventure, this is sufficient. Next, allocate a value to each character:

A = 1
:
:
Z = 26
. = 27
? =28
! = 29
SPACE = 30

Each value will occupy 5 bits. The 15 bits used by 3 letters can, therefore, be converted to 2 bytes. Consider the letters ABC. The binary representation of their values are:

Value	1	2	3
Binary	00000001	00000010	00000011

By loosing the left hand three bits of each binary number and crunching them together, the encoded bytes become:

00001000 10000110 (ie 8 and 134)

Listing 3 gives a simple compression and decoding routine using this approach.

The section between lines 1 and 200 compresses a string, S$ (see line 5), and stores it in RAM starting at address ME. Because the string ends in @ it will end in a zero byte, thus enabling the decoding routine to stop at the end of the string. Since characters are compressed in groups of three, the process is complicated slightly. Lines 10 and 20 pad out the string with extra @ characters until the string's length is divisible by 3.

The subroutines starting at 60000 and 61000 convert a character to it's appropriate value and vice versa. In both cases, the character is kept in C$ and its value in C. The compression and expansion of characters are performed in the subroutines at 50000 and 51000. Although the operations in these routines appear a little involved, they are really quite trivial and can be readily converted to machine code.

The routine starting at line 2000 will decode and print text stored at address ME until the terminating zero byte is found.

Using this routine is quite simple:

i) Encode the text using the first routine. The routine will give you details of the start and finish address. Keep a note of each start address! Always ensure that you terminate each with@.
ii) Save your encoded text using a machine code routine is quite trivial. compressed text can be LOADed at run time to save program space.
iii) Build the start addresses into your program by using data statements.

An example of storage of addresses is:

```
10 DATA L1,L2,L3,L4,L5
20 DATA H1,H2,H3,H4,H5
30 FOR I = 1 TO 5
40 READ L,H
50 ME(I) = H*256+L
60 NEXT I
70 ME = ME(3): GOSUB 2100
```

etc...etc...

Since the start addresses will be larger than 256, two byte representation is used. Line 70 gives an example call assuming that you type the decoding section in with the same line numbers as Listing 3. This line will print the message starting at ME(3).

If you test Listing 3, you will find the decoding routine a little slow. Whilst the speed suffices for most adventures, a machine code routine would obviously be more acceptable. Since the compression process essentially involves simple shifts and rolls, the corresponding machine code routine is quite trivial

Much of what I've discussed involves the storage of data in some area of RAM. For those of you with a machine code monitor, the manipulation of such data is quite simple. For those of you without this I've included Listing 4. This simple routine will save any block of RAM between $0000 and $CFFF. The routine

Program Listing 3

```
0 REM LISTING 3
1 REM
2 ME=12*4096: REM MESSAGES START AT $C000
3 REM
5 S$="WE ARE IN A SMALL HUT. THREE GNOMES SIT BY THE FIRE DRINKING MEAD.@"
10 IF LEN(S$)/3 = INT(LEN(S$)/3) THEN 30
20 S$=S$+"@":GOTO10
30 C1=1:TL=LEN(S$)+1:C2=1
40 FOR I=1TO3
50 CH$(I)=MID$(S$,C1,1)
60 C1=C1+1:NEXT
80 FOR I =1 TO 3
90 GOSUB 50000
100 POKEME+C2,B1:POKEME+C2+1,B2:C2=C2+2:
120 IFC1<>TLTHEN40
130 PRINTCHR$(147)"LENGTH OF ORIGINAL TEXT..."C1
140 PRINT"LENGTH OF COMPRESSED TEXT.."C2-1
150 PRINT"SIZE REDUCTION..."C2/C1*100"%"
160 PRINT"START ADDRESS..."ME
170 PRINT"END ADDRESS..."ME+C2-1
180 PRINT"COMPRESSED DATA...."
190 FOR I=1TOC2-1
200 PRINTPEEK(ME+I)",";:NEXT:END
1900 REM
1910 REM DECODE & PRINT MESSAGE STORED AT ADDRESS ME
1920 REM
2000 ME=12*4096:C1=1
2010 B1=PEEK(ME+C1):C1=C1+1:B2=PEEK(ME+C1):C1=C1+1
2020 GOSUB51000
2030 FOR I=1TO3
2040 C=CH(I):IFC=0THENEND
2050 GOSUB61000:PRINTC$;:NEXT
2060 GOTO 2010
49900 REM
49910 REM CONVERT TWO BYTES TO 3 CHARACTERS
49920 REM
50000 FORI=1TO3:  C$=CH$(I):GOSUB60000:CH(I)=C:NEXTI
50010 B1=CH(1)*8+(CH(2)*8 AND 224)/32
50020 B2=(CH(2) AND 3)*64+CH(3)*2: RETURN
50900 REM
50910 REM CONVERT 3 CHARACTERS TO TWO BYTES
50920 REM
51000 CH(1)=(B1 AND 248)/8
51010 CH(2)=(B1 AND 7)*4+(B2 AND 192)/64
51020 CH(3)=(B2 AND 62)/2:RETURN
59900 REM
59910 REM CONVERT CHARACTER TO VALUE
59920 REM
60000 IFASC(C$)>63ANDASC(C$)<91THENC=ASC(C$)-64:RETURN
60010 IFC$=" "THENC=30:RETURN
60020 IFC$="."THENC=27:RETURN
60030 IFC$="?"THENC=28:RETURN
60040 IFC$="!"THENC=29:RETURN
60050 PRINT"INVALID CHARACTER"
```

Program Listing 3

```
60900 REM
60910 REM CONVERT VALUE TO CHARACTER
60920 REM
61000 IFC<27THENC$=CHR$(C+64):RETURN
61010 IFC=27THENC$=".":RETURN
61020 IFC=28THENC$="?":RETURN
61030 IFC=29THENC$="!":RETURN
61040 IFC=30THENC$=" ":RETURN
 READY.
```

itself sits between £CF00 and £CF36. To LOAD any data saved with this routine, simply use:

LOAD "filename",dv,1
where dv=1 for cassette and dv=8 for disc.

In this series, I have deliberately avoided giving an adventure to type in since I wanted to give a set of general concepts rather than a spoon-fed game. To demonstrate some of the ideas described, I plan to prepare an extract from an adventure. This should appear in the near future, so watch this space.

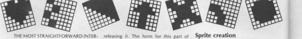
Program Listing 4

```
0 REM LISTING 4
1 REM
2 REM BLOCK SAVER
3 REM WILL SAVE ANY AREA OF RAM BETWEEN $0000 AND $CFFF
4 REM
10 DATA32,212,225,32,253,174,32,138,173,32,247,183,165,20,72,165,21,72,32,253
20 DATA174,32,138,173,32,247,183,165,1,41,254,133,1,166,20,164,21,104,133,21
30 DATA104,133,20,165,20,32,95,225,165,1,9,1,133,1,96
40 FORI=52992 TO 53046: READ X: T=T+X: POKEI,X:NEXT
50 IFT<>5940 THEN PRINT"ERROR IN DATA STA*EMENTS":END
100 PRINTCHR$(147);:INPUT"FILE NAME";FI$
110 INPUT"DEVICE DISK=8, CASSETTE=1";DE:IFDE<>1ANDDE<>8THEN110
120 INPUT"START ADDRESS (DECIMAL)";SA
130 INPUT"END ADDRESS (DECIMAL)";EA
140 IFEA>SATHEN160
150 PRINTCHR$(147)CHR$(18)"START ADDRESS GREATER THAN END ADDRESS!"CHR$(146)
160 GOTO120
170 SYS 52992 FI$,DE,2,SA,EA

READY.
```

Garry Marshall guides you, step by step, through this month's project – to write a menu-driven interactive graphics system.

PROGRAMMING PROJECTS



THE MOST STRAIGHTFORWARD INTERactive graphics packages offer a menu of shapes from which the user can pick one and then 'drag' a copy of it into position anywhere on the display screen before releasing it to 'fix' it there. A picture can then be constructed by placing all its component parts in the correct positions, relative to each other. The success of a package in a particular application will depend, in part, on the repertoire of shapes that it provides.

Graphics systems of this kind are available on many types of computer, including the largest ones. But, their ease of use does not mean that it is easy to write software for them. While it is one thing to write a program that works as long as you know what it expects of you, it is quite another matter to write a program for the naive user where no such assumptions can be made.

Setting the scene

We shall develop our interactive graphics program by using sprites – each of the shapes that can be chosen will be defined as a sprite. Because the 64 provides only a limited number of sprites, our menu will offer a choice of only two shapes, which will be sufficient to illustrate the principles involved in the creation of the system (you can increase the number if you want to). It is, therefore, important to select carefully the shapes which the program offers.

The program will be developed by first defining the two shapes and, then, positioning them on the screen as shown in Figure 1. They are positioned at the left of the screen with a vertical line separating them from the rest of the screen which naturally provides the display area, or 'canvas', on which we shall create our pictures. Each shape is numbered, and the instructions for 'picking' the shape (enter its number) are also displayed on the screen.

With this preparation, the program then allows the user repeatedly to pick one of the shapes and to drag it to the required position on the screen before releasing it. The form for this part of the program is:

```
REPEAT
    PICK SHAPE
    DRAG AND RELEASE SHAPE
END REPEAT
```

How it's done

The program will implement these operations as follows. When one of the shapes is picked, a new sprite will be created, which will have the same shape as the one that was picked and will be positioned directly under it. Then the new sprite can be dragged from its initial position to any desired position on the display area by pressing the appropriate keys. We shall use R, L, U and D as the keys for moving it a small distance to the right, the left, up and down, respectively. Finally, when the required position has been reached, the sprite can be fixed in that position by pressing another key, in this case the F key.

First steps

The initial screen can be set up, except for the shapes, by:

```
100 PRINT"♥";
110 FOR K=1 TO 19: PRINT "      |": NEXT K
120 FOR J=1 TO 38: PRINT "‾"; : NEXT J
130 PRINT "■";
140 FOR K=1 TO 18: PRINT
150 IF K=3 THEN PRINT"1"
160 IF K=8 THEN PRINT "2"
170 IF K=18 THEN PRINT "PRESS 1 OR 2 TO PICK A SHAPE"
180 NEXT K
190 PRINT "PRESS R, L, U, OR D TO DRAG IT"
200 PRINT "PRESS F TO FIX IT"
```

The graphics character in line 110 is that obtained by pressing CBM and H, and the one in line 120 by pressing CBM and Y.

Sprite creation

The next task is to position the sprites on the initial screen. To do this we must delve into the mechanics of designing, enabling and displaying sprites.

A sprite consists of 21 rows each containing 24 dots. Any of the dots can be coloured (to make a visible part of the sprite) or not coloured (to either form a hole in the sprite through which the background can be seen or help to define the shape of the sprite). Figure 2 shows the hash-shaped sprites (composed of two rows and two columns of coloured dots) that has been chosen as one of the shapes for our program.

Once a sprite has been designed, we have to describe that design to the computer. This is done by first using a 1 to represent a coloured dot and a 0 to represent a non-coloured dot. This gives 21 rows each of 24 binary numbers. If we take one of these rows, we can treat it as three 8-bit numbers, each of which can be converted to a decimal number. Thus, we get a set of numbers with which to tell the computer the shape of our sprite. There will be 63 numbers in all. For our 'hash' sprite, the numbers for most of the rows are 1, 1 and 0, but for the two rows where all the dots are coloured in the numbers are 255, 255 and 255.

Having designed a sprite, we have to know which locations the 64 uses to create and control it. Eight sprites can be handled, and they are numbered from 0 to 7. Our program will make use of the following locations each of which has the special purpose described in the following table. In the table, the variable N can assume any sprite number from 0 to 7.

Location	Purpose
2040+N	To point to the first location in the area of memory where the numbers giving the description of sprite number N are stored. The number to be stored here must be the address of the location divided by 64.
53269	To enable the sprites, with a 1 in bit N of this location enabling sprite number N.
53287+N	To determine the colour of sprite number N. This is done by placing a colour code in this location.
53248+2*N	To set the column position to be occupied by sprite number N. This is done by placing the number of a dot column in this location.
53249+2*N	To set the row position to be occupied by sprite number N. This is done by placing the number of a dot row in this location.

Using the sprites

The next part of the program begins by placing the description of the sprite illustrated in Figure 2 in the block of memory starting at location 832. It then places a second description, this time of a sprite with just one vertical line and one horizontal line, in the block starting at location 896. Line 300 assigns the first description to sprite number 0, and the second to sprite number 1. Line 310 enables sprite number 0 and sprite number 1. Line 320 gives the colour with code 7 (yellow) to both sprites. Line 330 gives a column and row, and so a position on the screen, for sprite 0, and line 340 does the same for sprite 1.

Once these two lines are obeyed, the sprites providing the shapes for our program appear in their initial positions as shown in Figure 1. Finally, line 350 stores, under the name S, the number of the next sprite which is to be created when we start picking shapes and dragging them onto the display area with the next part of the program. We have now created sprites 0 and 1, so the next sprite will be number 2.

The program segment is:

```
210 FOR K=0 TO 60 STEP 3
220 POKE 832+K,1: POKE 832+K+1, 1: POKE 832+K+2,0
230 IF K=18 THEN POKE 832+K,255: POKE 832+K+1, 255: POKE 832+K+2, 255
240 IF K=39 THEN POKE 832+K,255: POKE 832+K+1, 255: POKE 832+K+2, 255
250 NEXT K
260 FOR K=0 TO 60 STEP 3
270 POKE 896+K,1: POKE 896+K+1, 0: POKE 896+K+2,0
280 IF K=18 THEN POKE 896+K,255: POKE 896+K+1, 255: POKE 896+K+2, 255
290 NEXT K
300 POKE 2040,13:POKE 2041,14
310 POKE 53269,3
320 POKE  53287,7:POKE 53288,7
330 POKE 53248,30:POKE 53249,80
340 POKE 53250,30:POKE 53251,130
350 S=2
```

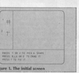


Figure 1. The initial screen

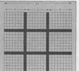


Figure 2. Design for a sprite

With the preliminaries completed, the remainder of the program must repeatedly pick one of the shapes and drag it onto the screen before fixing it there. Writing one subroutine for picking a shape (which starts at line 1000) and a second for dragging and fixing a shape (starting at line 2000) gives the remainder of the program as:

```
360 GOSUB 1000: REM PICK SHAPE
370 GOSUB 2000: REM DRAG SHAPE AND FIX IT
380 GOTO 360
```

Picking a shape

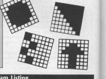
This subroutine scans the keyboard until either 1 or 2 is pressed. The new sprite is then displayed at the top left corner of the screen to give a visible cue that the shape is available: the new sprite is created and displayed directly under the one which it copies. Line 1010 displays the sprite number. Lines 1020 to 1050 create and position the copy, with line 1030 first enabling the new sprite and then making it share the description of sprite 0 or sprite 1 as appropriate. Line 1040 gives it the colour with code 1 (white). Line 1050 positions it under the sprite of which it is a copy. The subroutine is:

```
1000 GET C$:IF C$<>"1" AND C$<>"2" THEN 1000
1010 PRINT "♥";S
1020 C=VAL(C$)
1030 POKE 53269,PEEK(53269) OR 2↑S: POKE 2040+S,13+C-1
1040 POKE 53287+S,1
1050 POKE 53248+2*S,30: POKE 53249+2*S,80+50*(C-1)
1060 RETURN
```

Positioning the sprite

This subroutine begins by scanning the keyboard. It responds to the keys R, L, U and D for dragging, and to F for fixing. The first four keys move it, respectively, to the right, to the left, up and down with lines 2010 to 2040. All four lines work in the same way, and line 2010, for example, moves the sprite to the right if the R key is pressed, by increasing the column position of the sprite by 5. Line 2050 fixes the position of the sprite simply by leaving it in the position it has reached when the F key is pressed. It also increases the number stored under S by one so that the correct number is available for the next sprite when control is returned from this subroutine and the program goes back to call the subroutine starting at line 1000 to allow another shape to be picked. The subroutine for dragging and fixing is:

```
2000 GET A$: IF A$="" THEN 2000
2010 IF A$="R" THEN X=PEEK(53248+2*S)+5:POKE 53248+2*S,X
2020 IF A$="L" THEN X=PEEK(53248+2*S)-5:POKE 53248+2*S,X
2030 IF A$="U" THEN X=PEEK(53249+2*S)-5:POKE 53249+2*S,X
2040 IF A$="D" THEN X=PEEK(53249+2*S)+5:POKE 53249+2*S,X
2050 IF A$="F" THEN S=S+1: RETURN
2060 GOTO 2000
2070 RETURN
```



Program summary

The program creates its initial display showing the available shapes, the display area and the instructions for its use. Then the user can select one of its shapes by pressing its number, that is, by pressing 1 or 2. The shape that was selected can be dragged to any position on the display area by pressing in succession the keys R, L, U and D. Finally, it can be fixed at the position that it has reached by pressing F.

Further developments

The interactive graphics program we have developed can be amended, extended and improved in a variety of ways. These include the following.

- The shapes that the program provides can be improved upon, particularly if the interactive graphics are intended for some special application.
- The number of shapes in the menu offered by the program can be changed
- After a shape has been picked, it could be assigned a colour rather than having to be white as in the program.
- Since only eight sprites can be supported, the program should prevent its users from trying to create a ninth. At present, the program does not do this, and the consequences of such an attempt can be dramatic or even catastrophic. Make absolutely sure that you save the program before you first run it, because one mistake in the program's POKE instructions could cause the computer to 'hang'. But, if you intend to see what happens when you try for the ninth sprite make doubly sure that the program has already been saved. Experience shows that, at the very least, the computer will have to be reset after such an attempt, sometimes because it will not recognise the RUN command.
- After six copies have been dragged and fixed in position, the original two shapes in the menu could themselves be made to form part of the display.
- The program could be extended to record the picture that is created interactively so that a description of it can be stored to help recreate it another time.

Program Listing

```
100 PRINT"J";
110 FOR K=1 TO 19: PRINT "      I": NEXT K
120 FOR J=1 TO 38: PRINT "‾"; : NEXT J
130 PRINT "M";
140 FOR K=1 TO 18: PRINT
150 IF K=3 THEN PRINT"1"
160 IF K=8 THEN PRINT "2"
170 IF K=18 THEN PRINT "PRESS 1 OR 2 TO PICK A SHAPE"
180 NEXT K
190 PRINT "PRESS R, L, U, OR D TO DRAG IT"
200 PRINT "PRESS F TO FIX IT"
210 FOR K=0 TO 60 STEP 3
220 POKE 832+K,1: POKE 832+K+1, 1: POKE 832+K+2,0
230 IF K=18 THEN POKE 832+K,255: POKE 832+K+1, 255: POKE 832+K+2, 255
240 IF K=39 THEN POKE 832+K,255: POKE 832+K+1, 255: POKE 832+K+2, 255
250 NEXT K
260 FOR K=0 TO 60 STEP 3
270 POKE 896+K,1: POKE 896+K+1, 0: POKE 896+K+2,0
280 IF K=18 THEN POKE 896+K,255: POKE 896+K+1, 255: POKE 896+K+2, 255
290 NEXT K
300 POKE 2040,13:POKE 2041,14
310 POKE 53269,3
320 POKE  53287,7:POKE 53288,7
330 POKE 53248,30:POKE 53249,80
340 POKE 53250,30:POKE 53251,130
350 S=2
360 GOSUB 1000: REM PICK SHAPE
370 GOSUB 2000: REM DRAG SHAPE AND FIX IT
380 GOTO 360
1000 GET C$:IF C$<>"1" AND C$<>"2" THEN 1000
1010 PRINT "M";S
1020 C=VAL(C$)
1030 POKE 53269,PEEK(53269) OR 2↑S: POKE 2040+S,13+C-1
1040 POKE 53287+S,1
1050 POKE 53248+2*S,30: POKE 53249+2*S,80+50*(C-1)
1060 RETURN
2000 GET A$: IF A$="" THEN 2000
2010 IF A$="R" THEN X=PEEK(53248+2*S)+5: POKE 53248+2*S,X
2020 IF A$="L" THEN X=PEEK(53248+2*S)-5: POKE 53248+2*S,X
2030 IF A$="U" THEN X=PEEK(53249+2*S)-5: POKE 53249+2*S,X
2040 IF A$="D" THEN X=PEEK(53249+2*S)+5: POKE 53249+2*S,X
2050 IF A$="F" THEN S=S+1: RETURN
2060 GOTO 2000
2070 RETURN
```

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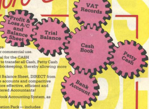

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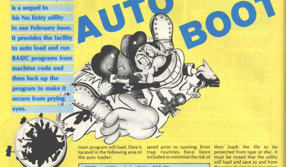
AUTO BOOT

Les Allen's utility is a sequel to his No Entry utility in our February issue. It provides the facility to auto load and run BASIC programs from machine code and then lock up the program to make it secure from prying eyes.



IN THIS ARTICLE, I SHALL explain how to provide a machine code based loader with auto boot. There are two locations in the memory map of the 6510 which cope with this requirement – the stack area and the warm start vector. I have included an explanation and a BASIC listing to provide the user with a method of auto-booting the main program which cannot be independently operated without the code offered by the auto loader.

The warm start vector located at $0302-$0303 is used to point to the start address of the auto loader. Sufficient memory exists between $02A7 and $0300 to enable an auto loader routine to be employed. Machine code based programs are easy to boot: they merely need a JUMP to the start address of the main program. But, with a BASIC program, this has to be restored and the main program forced to run by filling the input buffer with the ASCII code for RUN + RETURN.

The auto loader boots from $02A7 and automatically sets up the device from which the main program will load. Data is located in the following area of the auto loader:

```
$02E1  : ASCII code for RUN + RETURN
$02E5  : link to restore BASIC
$02EF  : length of file to be loaded
$02F0  : name of file to be loaded
```

Once the main file is loaded, the warm start vector is restored to normal, BASIC is restored to provide the link data to the next line, which was removed during the SAVE routine, and the program forced to run.

When a NEW is performed in BASIC, the first three locations in memory are filled with zeroes leaving intact the remainder of the program. When the main program file is saved, the first four bytes are written to $03E5 + increment and replaced with zeros, making it secure. With three bytes removed, the program could be LOADed in BASIC. However, with four bytes removed, this is not so straightforward.

The program listing provides a hex loader for the machine code routine required to load and secure the BASIC program. Only BASIC programs should be used with this utility.

The program must be entered exactly as written and saved prior to running. Error trap routines have been included to minimise the risk of a system crash. Included within this hex loader is a machine code routine to save the finished product as a machine code file which will work independently of the hex loader. Subsequently, the program will function with either tape or disc without any alteration whatsoever. Simply type LOAD for tape or LOAD"AUTOBOOT",8,1 for disc and the program will automatically load and boot the protection routine.

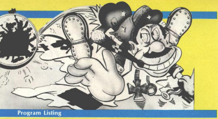
When completed, the program requests the name of the program file to be loaded for protection; the maximum length of the name file is 15 characters. Simply enter the required name correcting any errors with the DEL key and press RETURN. The program then loads the file to be protected from tape or disc. It must be noted that the utility will load and save to and from the same device as no provision is made for tape to disc or vice versa.

Once the program is loaded, it asks if it is OK to continue. If it is, you must place a blank tape or formatted disc into the drive, press REC and PLAY and enter 'Y' for yes. Two program files are now saved – the first bearing the name of the program loaded and the second the name + space. Any number of saves can be subsequently made by requesting a further copy.

To quit the routine, press F8 at any time while entering the name file or hit RUN/STOP and RESTORE keys simultaneously.

In conclusion, I should point out that this routine loads and auto runs the main file by restoring the missing link. It is not intended to lock up the program and make it totally secure. But, if the following POKEs are included, they will ensure a watertight program:

```
POKE775,200:REM Disable LIST command:POKE775,167
to restore
POKE808,225:REM Disable RUN/STOP key:
POKE808,235 to restore
POKE818,32: REM Disable SAVE routine:POKE818,237 to
restore
```



Program Listing

```
10 REM *** AUTOBOOT - SCRAMBLER FOR COMMODORE 64 ***
15 :
20 POKE53280,7:POKE53281,7
25 PRINTCHR$(147)CHR$(31)SPC(7)"*** AUTOBOOT SCRAMBLER ***"
30 PRINT:PRINT
35 PRINT"THIS MACHINE CODE PROGRAM IS DESIGNED TO"
40 PRINT"ALLOW THE USER TO PROTECT THEIR SOFTWARE"
45 PRINT"BY CREATING  A  M/C  ROUTINE WHICH LOADS"
50 PRINT"THE MAIN PROGRAM FILE.  ONCE LOADED THIS"
55 PRINT"IS FULLY DECODED TO  ENSURE THAT IT WILL"
60 PRINT"NOT OPERATE WITHOUT THE AUTOBOOT ROUTINE"
65 PRINTSPC(7)"SYS 49152      SAVE ROUTINE       "
70 PRINTSPC(7)"[F8]           QUIT ROUTINE       "
75 PRINT"THIS PROGRAM INCLUDES A  M/C  ROUTINE TO"
80 PRINT"SAVE BOTH THE AUTO BOOT AND MAIN ROUTINE"
85 :
90 REM **************** HEX  LOADER ****************
95 :
100 INC=0:SUM=0
105 READDA$:IFDA$="END"THEN165
110 IFLEN(DA$)<>2ANDDA$<>"END"THEN205
115 H=ASC(LEFT$(DA$,1)):H1=(H-48)*16:IFH>57THENH1=(H-55)*16
120 H=ASC(RIGHT$(DA$,1)):H2=(H-48):IFH>57THENH2=(H-55)
125 BCD=H1+H2:IFBCD<0ORBCD>255THEN205
130 POKE49152+INC,BCD:INC=INC+1:SUM=SUM+BCD
135 PRINT:PRINTSPC(5)"DATUM LEFT FOR TRANSFER :";
140 PRINT1024-INCCHR$(157)CHR$(32)CHR$(145)CHR$(145)
145 GOTO105
150 :
155 REM *************** SAVE  ROUTINE ***************
160 :
165 IFINC<>1024ORSUM<>123510THEN205
170 PRINTCHR$(147)"DATA TRANSFER COMPLETE"
175 PRINT:PRINT:PRINT"HAVE YOU SAVED THIS PROGRAM Y/N"
180 GETKEY$:IFKEY$<>"Y"ANDKEY$<>"N"THEN180
185 IFKEY$="Y"THENSYS50080
190 PRINTCHR$(17)CHR$(17)"SAVE"CHR$(34)"AUTOBOOT BASIC"CHR$(34)
195 PRINTCHR$(145)CHR$(145)CHR$(145)CHR$(145)
200 END
205 PRINTCHR$(147)"ERROR IN DATA STATEMENTS !!!":STOP
210 :
215 REM ****** HEX DATA FOR AUTOBOOT SCRAMBLER ******
220 :
225 DATA A9,00,85,C6,A9,0F,8D,20,D0,A9,06,8D,21,D0,A9,01
230 DATA 8D,86,02,A2,00,BD,08,C2,F0,06,20,D2,FF,E8,D0,F5
235 DATA 18,A0,15,A2,0A,20,F0,FF,A9,00,8D,EF,C1,20,E4,FF
240 DATA F0,FB,C9,0D,F0,24,20,D2,FF,C9,14,D0,06,CE,EF,C1
245 DATA 4C,29,C0,C9,8C,D0,03,6C,FC,FF,AE,EF,C1,9D,F0,C1
250 DATA EE,EF,C1,AE,EF,C1,E0,0F,D0,D3,AE,EF,C1,F0,CE,20
255 DATA 20,C3,A2,00,A9,0D,20,D2,FF,E8,E0,03,D0,F8,A9,01
260 DATA A6,BA,A0,FF,20,BA,FF,AD,EF,C1,A2,F0,A0,C1,20,BD
265 DATA FF,A9,00,A2,FF,A0,FF,20,D5,FF,20,30,C3,A2,00,BD
270 DATA A0,C2,F0,06,20,D2,FF,E8,D0,F5,20,E4,FF,F0,FB,C9
275 DATA 59,F0,07,C9,4E,D0,F3,4C,00,C0,AE,EF,C1,A9,20,9D
280 DATA F0,C1,A2,00,BD,01,08,9D,E5,C1,E8,E0,04,D0,F5,EE
285 DATA EF,C1,A2,00,BD,A7,C1,9D,A7,02,E8,E0,5D,D0,F5,A9
290 DATA FF,8D,FE,CF,8D,FF,CF,A9,00,85,FB,A9,08,85,FC,A0
295 DATA 00,B1,FB,D0,0A,CD,FE,CF,F0,19,CD,FF,CF,D0,03,8D
300 DATA FE,CF,8D,FF,CF,C8,D0,E9,E6,FC,A5,FC,C9,80,D0,E1
305 DATA 6C,FC,FF,84,FB,E6,FB,D0,02,E6,FC,CE,EF,C1,20,20
310 DATA C3,A9,01,A6,BA,A0,01,20,BA,FF,AD,EF,C1,A2,F0,A0
315 DATA C1,20,BD,FF,A9,A7,85,2B,A9,02,85,2C,A9,2B,A2,04
320 DATA A0,03,20,D8,FF,EE,EF,C1,A9,00,AA,9D,01,08,E8,E0
325 DATA 04,D0,F8,A9,01,A6,BA,A0,01,20,BA,FF,AD,EF,C1,A2
330 DATA F0,A0,C1,20,BD,FF,A9,01,85,2B,A9,08,85,2C,A9,2B
335 DATA A6,FB,A4,FC,20,D8,FF,20,30,C3,A2,00,BD,C8,C2,F0
340 DATA 06,20,D2,FF,E8,D0,F5,20,E4,FF,F0,FB,C9,4E,F0,04
345 DATA C9,59,D0,F3,8D,FD,CF,A2,00,BD,F0,C2,F0,06,20,D2
350 DATA FF,E8,D0,F5,AD,FD,CF,C9,4E,F0,03,4C,08,C1,4C,00
355 DATA C0,EE,EE,EE,EE,EE,EE,A5,BA,AA,A8,20,BA,FF,AD,EF
360 DATA 02,A2,F0,A0,02,20,BD,FF,A9,00,20,D5,FF,86,2D,84
365 DATA 2E,A9,83,8D,02,03,A9,A4,8D,03,03,A2,00,BD,E1,02
370 DATA 9D,77,02,BD,E5,02,9D,01,08,E8,E0,04,D0,EF,86,C6
375 DATA 60,52,55,4E,0D,17,08,0A,00,05,00,00,00,00,00,00
380 DATA 00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
385 DATA 8B,E3,A7,02,EE,EE,EE,EE,93,11,11,20,20,20,20,20
390 DATA 20,20,20,75,60,60,60,60,60,60,60,60,60,60,60,60
395 DATA 60,60,60,60,60,60,60,60,60,60,69,0D,20,20,20,20
400 DATA 20,20,20,20,7D,20,41,55,54,4F,42,4F,4F,54,20,20
405 DATA 20,53,43,52,41,4D,42,4C,45,52,20,7D,0D,20,20,20
410 DATA 20,20,20,20,20,6A,60,60,60,60,60,60,60,60,60,60
415 DATA 60,60,60,60,60,60,60,60,60,60,60,60,6B,0D,0D,0D
420 DATA 0D,0D,0D,20,20,20,20,45,4E,54,45,52,20,46,49,4C
425 DATA 45,20,4E,41,4D,45,11,20,20,65,65,65,65,65,65,65
430 DATA 65,65,65,65,65,65,65,65,00,EE,EE,EE,EE,EE,EE,EE
435 DATA 0D,20,20,20,20,20,20,20,41,4C,4C,20,52,49,47,48
440 DATA 54,20,54,4F,20,43,4F,4E,54,49,4E,55,45,20,20,59
445 DATA 2F,4E,0D,00,EE,EE,EE,EE,0D,05,20,20,20,20,20,20
450 DATA 20,20,20,20,20,41,4E,4F,54,48,45,52,20,43,4F,50
455 DATA 59,20,20,20,59,2F,4E,0D,00,EE,EE,EE,EE,EE,EE,EE
460 DATA 91,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20
465 DATA 20,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20
470 DATA 20,20,20,20,20,20,0D,91,91,91,91,00,EE,EE,EE,EE
475 DATA A9,01,8D,21,D0,A9,06,8D,86,02,60,EE,EE,EE,EE,EE
480 DATA A9,06,8D,21,D0,A9,01,8D,86,02,60,EE,EE,EE,EE,EE
485 DATA 20,44,E5,A9,00,8D,20,D0,8D,21,D0,A9,01,8D,86,02
490 DATA A9,01,A6,BA,A9,FF,20,BA,FF,A9,09,A2,F0,A0,02,20
495 DATA BD,FF,A9,00,A2,FF,A0,FF,20,D5,FF,A9,83,8D,02,03
500 DATA A9,A4,8D,03,03,4C,00,C0,00,00,00,00,00,00,00,00
505 DATA 00,00,00,00,00,00,00,00,00,41,55,54,4F,42,4F,4F
510 DATA 54,20,00,00,00,00,00,00,00,8B,E3,A7,02,EE,EE,EE
515 DATA 20,44,E5,A2,00,BD,40,C3,9D,A7,02,E8,E0,5D,D0,F5
520 DATA A9,01,A6,BA,A0,01,20,BA,FF,A9,08,A2,36,A0,C2,20
525 DATA BD,FF,A9,A7,85,2B,A9,02,85,2C,A9,2B,A2,04,A0,03
530 DATA 20,D8,FF,A9,01,A6,BA,A0,01,20,BA,FF,A9,09,A2,36
535 DATA A0,C2,20,BD,FF,A9,00,85,2B,A9,C0,85,2C,A9,2B,A2
540 DATA 40,A0,C3,20,D8,FF,4C,00,C0,EE,EE,EE,EE,EE,EE,EE
545 DATA END
550 :
555 :
560 ***************************************************
565 *                                                 *
570 *      AUTOBOOT SCRAMBLER FOR COMMODORE 64        *
575 *                                                 *
580 *        UTILITY COMMANDS ARE AS FOLLOWS          *
585 *                                                 *
590 *        SYS 49152          SAVE ROUTINE          *
595 *                                                 *
600 *        [F8]               QUIT ROUTINE          *
605 *                                                 *
610 *                                                 *
615 *        LES ALLAN        11TH DEC 1984           *
620 *                                                 *
625 ***************************************************

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FINAL
00000
SCORE
HOLLAND PARK
19:30
TIME: 19:41
00009
WARWICK AVE
LEICESTER SQ
20:16
SCANNER
TIME: 20:25
00371
ST PAULS

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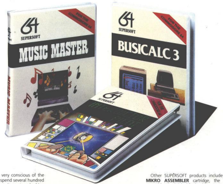

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